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AFJL Salutes...

Lieutenant General Leo Marquez

DCS/Logistics and Engineering
Headquarters United States Air Force
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ARTICLES

Purpose The *Air Force Journal of Logistics* provides an open forum for the presentation of issues, ideas, research, and information of concern to logisticians who plan, acquire, maintain, supply, transport, and provide supporting engineering and services for military aerospace forces. It is a non-directive, quarterly periodical published under AFR 5-1. Views expressed in the articles are those of the author and do not necessarily represent the established policy of the Department of Defense, the Department of the Air Force, the Air Force Logistics Management Center, or the organization where the author works.

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AFJL salutes

Lieutenant General Leo Marquez

Deputy Chief of Staff, Logistics and Engineering
Headquarters, United States Air Force
August 1983 - August 1987

I don't ever, ever, ever want to hear the term logistics tail again. If our aircraft, missiles, and weapons are the teeth of our military might, then logistics is the muscle, tendons, and sinew that make the teeth bite down hard and hold on—logistics is the jawbone! Hear that? The JAWBONE!

It was more than rhetoric as General Marquez stood before audiences all across the Air Force and buried the old image of the ponderous, bulging mass of khaki-draped supplies that for years had characterized military logistics. He replaced this notion with one of responsive power, synchronized closely with the flow of the battle, trimmed of fat, and poised to provide sustained striking force wherever needed. Logistics is *muscle*, not fat!

Primary dependence on mass, he said, would no longer win for the US. Our edge would henceforth lie in being smarter and controlling the battlefield:

When we reach into our quiver of airpower arrows, we must first draw those forged from brains—not mass, money, or more manpower.

Then, he set about molding Air Force logistics to meet the new image.

The past four years have been packed with accomplishments initiated or guided from General Marquez's cockpit on the fourth floor E-ring of the Pentagon. Focusing on the smart allocation and use of basic building blocks of warfare—bombs, bullets, and black oil—he organized and equipped the logistics force for maximum aircraft availability and sortie production. He was the driving force behind the more than 10% increase in supportable tactical and airlift wartime sorties (FY86 over 84), as well as the 100% funding of peacetime operating stocks (POS) in FY86. His defense of the FY87 Air Force budget resulted in OSD restoring $170 million for aircraft replenishment spares, $83 million for missile spares, and $74 million for the Air Force Stock Fund. He gained OSD and Congressional support for more than $3 billion in programs to procure and pre-position critical war reserve materiel in NATO and Southwest Asian theaters. The list goes on. These examples were big accompl shments in categories that had been painfully underfunded for years.

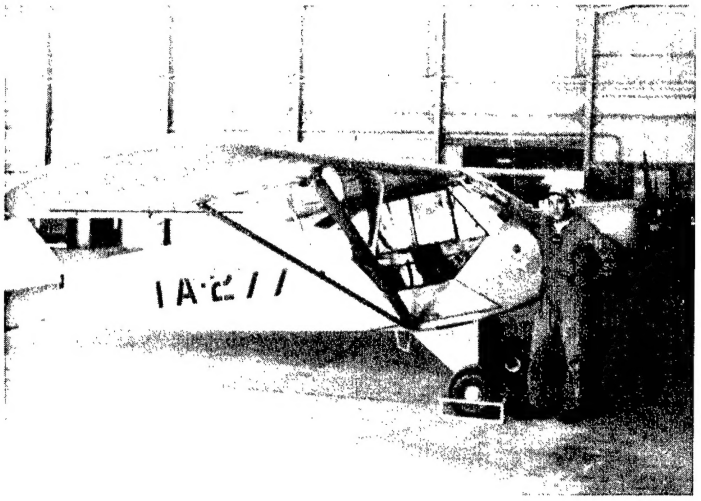
Such gains could not have been won without *credibility*, which had been sorely damaged by a surge of media attention on spare parts policies. During the dark days, General Marquez dubbed himself "CINC/Horror," with reference to the daily deluge of revelations about screwdrivers, ladders, hammers, and coffeepots. What was rarely revealed to the public, though, was that L&E had recognized the problem and put the gears in motion to fix the causes well before it all started to hit the fan. General Marquez presided over implementation of 98% of the 285 ideas stemming from the Air Force Management Analysis Group (AFMAG) on spare parts acquisition and the Support Equipment Acquisition Review Group (SEARG).

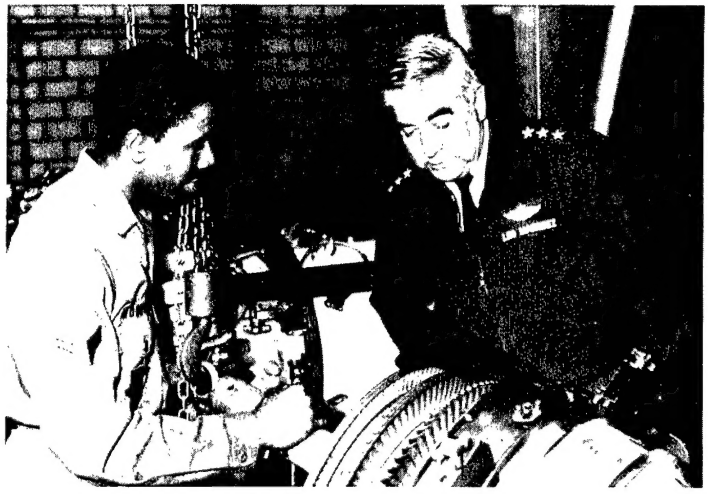
At the air base, tremendous changes came about in the way maintenance and supply interacted and supported flying activities. The changes were based on his long-held belief that the flight line—where the action is—is also where resources, responsibility, and authority ought to congregate:

I had learned that providing centralized direction from a maintenance control office located remote from the flight line was not the way to go. Though contrary to policy, as OMS Commander I had exercised strong authority from the flight line where I knew what was needed and could call for the right help at the right time. I arrived at Bien Hoa having already developed antipathy toward off-scene decision-making and was willing, as Chief of Maintenance, to grant a tremendous amount of latitude to local line chiefs. They recognized my receptiveness to their problems, and we were able to work together quite effectively despite the fractious organizational setup.

At the tip of the arrow, our bases are reflecting this view. His Munitions Tiger Team did the spadework for the new Combat Ammunition System that will place munitions in users' hands when needed. Rivet Workforce initiatives are bringing maintenance units into alignment with the changing air base environment; new training and classification procedures will trim the size of deployed maintenance units while making them more capable, mobile, and flexible. Supply assets and people were moved closer to the flight line, and a consolidated materiel control function freed maintenance people for on-aircraft work. Petrol Ready initiatives are making sure aircraft hydrants and base gas pumps don't run dry by increasing war reserve stocks and making them more available to users, developing new installed equipment, and upgrading mobility fuels equipment. Revised stockage policies that put supplies closer to the point of use raised supply effectiveness to an historic 90% and avoided 140,000 grounding incidents. The Secretary of the Air Force summed it up well: "More has been done in the last 12-18 months in supply than over the past twenty years."

General Marquez didn't neglect the lines of communication that bring our silver bullets forward, either. He was instrumental in the publication of Defense Transportation Policy Memorandum 86-1, the product of two years' interservice negotiation, which ensures MAC airlift is fully utilized and wartime readiness is maintained. He led the fight for funding the Civil Reserve Air Fleet (CRAF) Enhancement Program, adding almost 3 million ton-miles per day of wartime airlift capability. And, he helped solidify public





opinion through his expert and humane direction of over 4,000 emergency airlift requests. Included were assassination victim movement from the Near East, evacuation of train bombing victims in Peru, a domestic heart transplant movement, and a bone marrow movement from Guam to Hawaii.

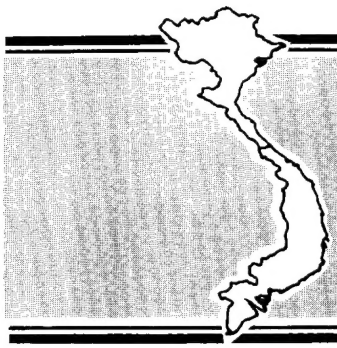
Wartime aside, our daily living was of deep concern to General Marquez. He just defended the largest Military Construction Program budget ever. In addition to facility improvement, he executed Sections 801 and 802 build-lease authorities to improve quality of living at five major stateside bases. When we change duty stations, all Air Force members will appreciate his Increased Valuation Program which raised the carriers' insured value of household goods shipments from $.60 to $1.25 per pound, providing an extra deterrent against gorilla-fisted furniture bashers.

Looking to the future, General Marquez saw opportunity knocking in the Advanced Tactical Fighter (ATF) program and used the opportunity to inject definable, quantifiable R&M features. He assured adequate and safe bed-down for new Peacekeeper and GLCM systems. His frequent use of Tiger Teams encouraged logistics leaders to take visionary forward glimpses of what "could and should be," so that planning and programming could start moving there. Notice we said *planning*, as well as programming. Restoring the capability for the Air Staff to climb up from the perpetual, daily grind of programming and execution to do some integrated, realistic planning for tomorrow's Air Force may prove to be his greatest legacy of all.

"I had a unique feeling about this new logistics officer as he came through AFIT courses. It was clear that he would become something special to us," AFIT Professor Emeritus Jerry Peppers once told *AFJL*. How right you were, Jerry! General Marquez has indeed left his mark on his Air Force and his country. For the 300,000 loggies who have benefitted, *AFJL* expresses heartfelt thanks.

Blue Two will miss this exceptional leader.

AFJL Editors



Project Turnkey: Historical Perspectives and Future Applications

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Air Force civil engineers entered the war in Southeast Asia (SEA) with a Korean War combat engineering experience base. But the wars and the times were different. Accordingly, Southeast Asia became a combat proving ground for civil engineering, which was witnessing a new birth in mobility, military troop construction, and expedient air base construction—all in support of a rapidly growing air war. The Vietnam experience tested Prime BEEF (Base Engineer Emergency Force) mobility capabilities; created and employed RED HORSE (Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers); fielded our first military troop construction squadrons; and tested military construction capabilities to rapidly build expansive new jet air bases.

This article concentrates on the last major initiative, the construction of Tuy Hoa Air Base, South Vietnam, using a unique construction technique called "turnkey." Under the turnkey concept, a single contractor would design and construct a complete project.

"For the first time in history, the military—engaged in a war—found itself almost entirely relying on civilian construction support."

Project Turnkey represented a historic milestone in Air Force civil engineering. For the first time since World War II, the Department of Defense (DOD) had awarded a design-construction contract. And, for the first time in its 19-year history, the Air Force was permitted to function as its own construction agent on a project of this magnitude. (12:24) Apparently, the Air Force had finally entered the large-scale military construction arena, which had been closely guarded by the Army Corps of Engineers and the Naval Facilities Engineering Command. (12:24)

Urgency of Need

The US Military Assistance Command Vietnam (MACV) was the command element in South Vietnam. The Navy was designated the construction agent, responsible for supervising all civilian military contract construction in SEA. Since 1962, the Navy had been accomplishing all construction under a cost-plus-fixed-fee contract with a civilian construction combine called RMK-BRJ.* The contract essentially paid the contractor a specified "fixed-fee" over and above actual construction expenses incurred. This proved to be an attractive arrangement for the contractor and was responsive in providing facilities for the tri-services in the early part of the war. However, by 1965, the SEA military build-up was escalating. Airfield overcrowding prevented assigning additional flying units to South Vietnam. Air Force units were concentrated at three airfields: Tan Son Nhut, Bien Hoa, and Da Nang. MACV approved three additional airfields for construction at Cam Ranh Bay, Phan Rang, and Phu Cat. (4:255) RMK-BRJ was to build each one. For the first time in history, the military—while engaged in a war—found itself almost entirely relying on civilian construction support. (5:45)

*Raymond International Inc., New York; Morrison-Knudsen Co. Inc., Boise; Brown-Root Inc., Houston; and J. A. Jones, Charlotte, N.C.

The altered topography between August 1966 and November 1967 reveals massive changes. A dredge was imported from Tahiti to cut a channel 500 feet through the peninsula before the monsoon season could hamper operations.

In early 1966, the combat flying requirements confirmed the Air Force's need for a fourth jet air base to meet the demands of a growing air war. The base had to be operational by the end of 1966. The site selected was Tuy Hoa, a sandy delta on the coast of the South China Sea 240 miles northeast of Saigon. A dilemma unfolded as RMK-BRJ was saturated with work and could not support the operational date any earlier than June 1967 without altering urgently required tri-service construction projects.

With construction underway at the new jet bases at Cam Ranh Bay and Phan Rang, RMK-BRJ had surged to over $500 million worth of on-going military construction projects. The critical requirements imposed by an enlarged air war had simply outstripped the one manager/one contractor construction practice used by the Navy and RMK-BRJ. The Air Force was additionally constrained by shortages of in-theater equipment, materials, labor, and port facilities. (3:253)

Major General Robert H. Curtin, Air Force Director of Civil Engineering, summed up the SEA construction situation:

> We felt from our point as a customer, that the people running the store were in too big an operation. We would have liked to see it broken down into smaller segments for managing. In any event, we did feel that the RMK-BRJ operation was getting too big and unwieldy. (14:221)

Turnkey Concept

The Air Force recommended a new construction concept totally separate from the existing Navy and RMK-BRJ effort. The Air Force proposal called for using a new American contractor not previously involved in SEA. The proposal, called "turnkey," would require a stateside contractor, under Air Force direction, to take on a "packaged job" of managing and supervising the entire task of designing and constructing a completely operational air base, "turning-the-keys over" to the Air Force when finished. (9:160)

Using the turnkey procedure, the contractor would be responsible for both design and construction. This represented a significant departure from the traditional design-bid-construct contracting practice used by the Navy (and the Army Corps of Engineers). Under the traditional practice, the project design would be obtained by contract from an architect-engineer design firm, followed by construction by separate contract with a construction firm (RMK-BRJ for projects in South Vietnam). (14:221)

The unique feature of turnkey was the entire project of designing and building would be performed by the same contractor. Therefore, construction people were involved in the design of facilities from the very beginning. Except for real-estate acquisition and physical security, the contractor would be responsible to the Air Force for the entire project. This included all design, procurement of supplies and equipment, transportation to the site, labor management, and construction. (9:160)

Senior Air Force officials lobbied in Washington for approval of the proposal. Brigadier General Guy H. Goddard, Deputy Director for Construction, Directorate of Civil Engineering, summarized the new initiative:

> Mr McNamara empowered the Air Force to act as its own design and construction agent, and to retain a contractor outside the RMK-BRJ contract. And we did this with the full concurrence of MACV, General Westmoreland, and with the full realization that our method of operation had to be confined so as not to do damage of any type to the other effort (construction) which was most important. (14:221)

The Air Force imposed several restrictions on the turnkey concept to keep within the DOD mandate not to interfere in any way with existing military construction in SEA. The restrictions included: (12:24-25)

- To prevent further crowding of Vietnamese ports, all men, equipment, and materials must come in over the beach at Tuy Hoa.
- To avoid competing with RMK-BRJ for local labor, multiskilled US labor would build the base, working ten hours per day, seven days per week. Local labor hired must come from the Tuy Hoa area.
- To further protect the South Vietnamese economy from inflation, the turnkey workers would receive only 5% of their wages in-country, and that in military script. The remaining 95% would be deposited in accounts back in the US.
- To reduce competition with RMK-BRJ for Pacific shipping, all turnkey equipment and materials would be shipped only from East coast or Gulf ports.
- To reinforce the isolation, US employees must abide by rules designed to keep them out of local affairs.

Although separate of Navy controlled SEA military construction, Project Turnkey would be independently controlled by the Air Force as part of the established MACV construction management operation. The Secretary of Defense officially approved Project Turnkey on 27 May 1966. (3:254) The Air Force had its wish—to build an air base from a zero base and act as its own construction agent. However, the Air Force had promised combat air missions out of Tuy Hoa by December 1966—only seven months away!

Contract Provisions

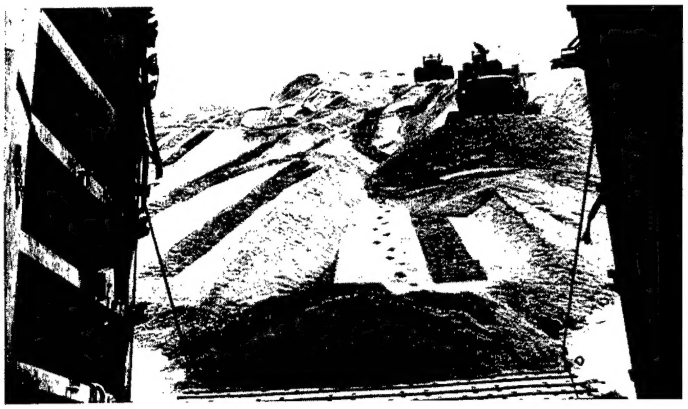
The Air Force estimate to complete Project Turnkey was $52 million. A cost-plus-fixed-fee contract was chosen, similar to the contract arrangement between the Navy and RMK-BRJ.

Reacting to the short deadlines, the Air Force began negotiating with civilian construction contractors in March 1966 in anticipation of DOD approving the project. Response from industry appeared enthusiastic. Nine construction firms were initially solicited to provide estimates. Walter Kidde Construction (WKC) from New York was eventually selected on 13 May 1966 as the Turnkey contractor.

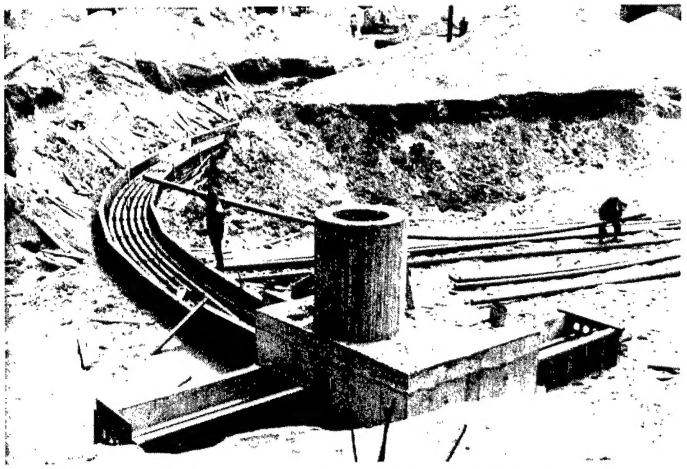
To meet the wartime mission dates, Project Turnkey was divided into two separate phases. The first phase was to provide an interim expeditionary airfield using government furnished AM-2 aluminum matting and mobile kit facilities. The second phase was a completely operational concrete airfield with all supporting facilities and utilities to support four jet fighter squadrons and several thousand men. (3:258) The concept of operation entailed constructing the second phase while combat air missions were being flown from the AM-2 expeditionary runway.

Since only seven months remained before the interim airfield was required, a compressed project schedule required WKC to: (7:2-5)

- Complete all designs ..... 90 days (31 Aug 66)
- Complete mobilization of forces, materials and equipment, ready to start work on interim airfield facilities..... 120 days (30 Sep 66)



Across the beach delivery. Bulldozers push through the sand to the open doors of a landing ship bringing construction supplies to Tuy Hoa.



Communications ducts being installed between wing facilities.

- Complete construction of interim airfield facilities.....210 days (27 Dec 66)
- Complete all remaining airfield construction .....390 days (24 Jun 67)

The project initially included constructing a port complex at Tuy Hoa, but this was later deleted by JCS in favor of the existing port facilities at Vung Ro, 22 miles to the south.

The Air Force engineers' three-month estimate for WKC to mobilize and begin work predicted no physical construction was likely to start before October 1966. This left only three months to construct the interim airfield and 9.5 total months to complete the entire project. To preclude any work slippages, the Air Force engineers included several monetary incentives for performance and employee conduct to entice WKC to meet all scheduled dates.

In addition to the stated fixed-fee of $2.17 million for design and construction, WKC could receive another $1 million for completing all construction ahead of schedule and controlling their in-country work force. (10:2)

The incentives concerned three separate areas. First, individual monetary bonuses of $1000 could be earned by WKC's employees for general good conduct and diligence on the job. The restriction imposed was *all* employees must earn the bonus or none would. (4:608) Second, WKC could receive $100,000 for the effectiveness of their employee discipline program and controlling possible inflationary impacts on the South Vietnamese economy. (4:608-609) Third, WKC could earn $900,000 for meeting or exceeding required construction

Flight line ramp being constructed by Vietnamese workers, November 1966.

Red Horse team members take rough edges off AM-2 mat runway sections.

completion dates. This consisted of $400,000 for the interim facilities in phase one, $360,000 for sustained facilities in phase two, and $140,000 for manpower demobilization toward the latter project stages.

Project Turnkey proved to be a unique departure from the typical military construction practice. The restrictions and monetary incentives were normally not part of the traditional lump-sum competitive bid procedure.

The Air Force's Project Turnkey had the eyes and ears of the entire DOD and military establishment, even before WKC had set foot on the site or begun design of the first facility.

Building Tuy Hoa

The clock ticked away on Project Turnkey and, by mid-June 1966, RMK-BRJ had steadily progressed in construction at the other new fighter bases in South Vietnam. Air Force civil engineers charged ahead with a compressed schedule with absolutely no room for delays or construction slippages. The Project Turnkey motto became: "Do It Once—Do It Right." (6:4) Every stage of the project from mobilization through construction was designed and managed to employ timesaving measures to get the job done.

To manage Project Turnkey, and keep within the established MACV chain of command in SEA, the Director of Civil Engineering for Seventh Air Force at Tan Son Nhut AB, Colonel Archie S. Mayes (later Brigadier General), was appointed the Project Turnkey director. He was designated TKC-1.

Colonel Mayes' management operations staff included 50 Air Force representatives stretching across the globe from New York to Saigon to the sandy deltas of Tuy Hoa. TKC-2 was established at WKC's New York home offices to manage project design, mobilization, and procurement. A small element, TKC-2-1, was formed at the gulf port of Brookley AFS in Mobile, Alabama, to monitor shipping. TKC-3, under Colonel David S. Chamberlain (later Brigadier General), was the on-site manager at Tuy Hoa.

WKC was impressed with the urgency and lost no time negotiating with subcontractors for shipping, transportation, and construction. B.B. McCormick and Sons Inc. of Jacksonville Beach, Florida, was hired as the principal construction subcontractor for building the horizontal work (i.e., AM-2 and concrete airfields, roads, water, and sewage systems). WKC would construct the remaining vertical facilities and electrical distribution system.

The limitation of a 700-man US work force required WKC to recruit multiskilled workers proficient in several trades. Examples included a heavy equipment operator-truck driver, iron worker-carpenter-cook, welder-barber, and even a mortician-truckdriver. Despite the promise of long hours in a hostile environment and little time off, over 4,000 men applied. (12:24-25)

Success of the mobilization phase was the first crucial step. Within three weeks after the contract was signed, the first ship departed from Philadelphia laden with a portion of the 3.4 million square yards of AM-2 matting needed for the interim airfield. McCormick followed suit and within four weeks had over $12 million worth of materials en route to Tuy Hoa. (8:2-3) By mid-July 1966, five vessels were at sea bound for Tuy Hoa. Within 7.5 months the last ship bound for Tuy Hoa would depart the US. The contractor had shipped 75,000 tons of materials through the port at Brookley AFS; when completed, over 161,000 tons of materials would be delivered to Tuy Hoa.

Throughout the design of Project Turnkey, simplicity and rapidity of construction were strictly emphasized. (9:163) Initial designs were completed in only enough detail to permit material estimates for construction supplies and equipment. Plans were later refined and literally approved on the drawing board by the Air Force engineers at TKC-2 in New York. (7:5) To accelerate design, flexibility was crucial. Maximum use was made of off-the-shelf products including packaged systems, prefabricated buildings, and adapting facility designs to structures already in use in SEA.

"Contractor facilities were carefully planned and sited to be incorporated into usable base facilities when completed."

The Air Force base master plan for Tuy Hoa was strictly enforced to prevent chaos at the construction site. The plan forbid makeshift or temporary contractor facilities typically found on large construction sites. Contractor facilities were carefully planned and sited to be incorporated into usable base facilities when completed. (9:163) The contractor's motor pool became the base motor pool, the morgue became the air-conditioned base computer facility, and the worker housing eventually became the home for the military officers and men. To prevent congestion, interim facilities in excess of a single tent had to be approved in advance by TKC-1. (15:11-13) Even construction roads and haul routes followed the final road configuration. This prevented random traversing across the air base and aided in effectively compacting the final road subgrade. (15:13)

Designs progressed so rapidly plans were completed on 39 facilities comprising 300 construction drawings within 11 weeks following the contract. WKC completed design within the original 90-day contract stipulation.

In early June 1966, the first 30-man contractor advance party and Air Force engineers arrived at Tuy Hoa. The 4340-acre site was barren except for the tents of the 101st Airborne Division, which had secured the area earlier from the Viet Cong. The first ship arrived 11 August 1966 with materials for the 80-man portacamp. This camp would eventually expand to accommodate the full 700-man deployment.

On 25 August 1966, construction started on the 9000-foot interim airfield. By 1 September, 30 days ahead of schedule, WKC was fully mobilized at Tuy Hoa with 700 US workers. Two weeks later, 29,000 tons of material were off-loaded on site. WKC hired 300 Philippine stevedores to unload supplies over the beach and an additional 600 South Vietnamese laborers.

Fueled by monetary incentives for early completion, WKC steadily progressed with construction. During the first week of October 1966, the interim airfield soil-cement base was ready to accept the first 2 x 12-foot section of AM-2 aluminum matting. Construction crews working 10-hour days laid the matting at a rate of 600 to 800 linear feet per day. (11:4-7) By mid-October, the interim airfield was 50% complete and, on 12 November 1966, the last piece of matting was locked into place.

The first aircraft to use the new strip on 12 November were C-124 and C-130 transports carrying navigational aid and ground control approach equipment. The interim airfield was finished and operational a full six weeks ahead of schedule.

On 15 November 1966, 18 F-100 Super Sabres of the 308th Tactical Fighter Squadron flew combat missions from Bien Hoa and recovered at their new base at Tuy Hoa. The F-100s began flying combat air strikes from Tuy Hoa the very next day. Tuy Hoa had gone to war six weeks early.

By mid-December 1966, two more F-100 squadrons from the 31st Tactical Fighter Wing, Homestead, Florida, arrived at Tuy Hoa, making the wing fully operational.

By the end of December, WKC had completed the interim facilities—the mat airfield, sufficient petroleum, oil and lubricants (POL) and ammunition storage, communications facilities, navigational aids, fighter squadron operations building, dining hall, basic utilities, and road network within the specified 210-day requirement. (3:260)

The contractor immediately began constructing the 9500-foot concrete runway and sustained facilities required in phase two. Facilities were virtually completed on a daily basis with design changes resolved in the field by Air Force engineers at Tuy Hoa. The concrete airfield was finished on 28 April 1967. By mid-May 1967, the base was essentially complete with a cantonment area for 4,000 men, two jet capable runways with full aircraft parking, maintenance and operations facilities, POL storage, and the supporting physical plant. (3:260) On 10 June 1967, all contract facilities were completed two weeks ahead of schedule and by 12 June the majority of the contractor work force was demobilized. (1:30)

In a single year, Project Turnkey had transformed some of the most isolated real estate in South Vietnam into a fully

operational jet fighter base. The Air Force had kept its promise: combat air strikes were being flown from Tuy Hoa less than seven months after signing the contract and without infringing on any other military construction on-going in SEA.

Lessons Learned

Project Turnkey provided, ahead of schedule, a valuable extension to the combat air units fighting the war in Vietnam. The net construction cost was within the programmed $52 million. (1:31) In fact, in comparable contract dollars for Phan Rang and Cam Ranh Bay, the number of facilities at Tuy Hoa was 30% greater and completed in a shorter period of time. (13:9) This represented a signficant achievement in providing facilities to support the bed-down of additional aircraft in a combat theater. Lt General William W. Momyer, Commander, Seventh Air Force, summarized the accomplishment:

> This means that F-100 Super Sabres will be able to reach vital targets faster. They'll be able to provide even more effective air support of friendly ground forces. And in the long run they'll contribute to saving American lives. (11:7)

He also cited the fact that as a result of Tuy Hoa AB, the time gap between a call for air strikes, and the response, would be reduced by precious minutes. (11:7)

The principal lessons learned demonstrated the distinct advantage, where time is a premium, of using the same contractor for design and construction coupled with the provision for total on-site change order authority by Air Force civil engineers. This involved the construction force in the project from the design stage and is a significant departure from the traditional design-bid-construct approach. Delays were few and the overdesign of simple items caused by the inflexibility of architect-engineer design firms operating in Vietnam under conventional peacetime contracts was eliminated. (4:267) The authority given to the TKC-3 Air Force civil engineers at Tuy Hoa to make immediate field changes prevented construction delays. This also departed from the traditional approach in which the final decision is usually resolved at higher levels of management. Although not all field changes reduced construction man-hours, the ratio of increased man-hour changes to decreased changes was on the order of 1-to-15. (6:14) The total number of field changes was minor in comparison with similar construction projects. (4:267)

Another lesson lay in the direct relationship between monetary incentives and contractor performance and work force control. The timely completion of Project Turnkey enabled WKC to collect the full incentive package. By abiding by WKC's list of commandments (Figure 1), the civilian workers collected the individual bonuses and remained out of local affairs. The $900,000 performance and demobilization incentive was key in delivering the facilities on time to meet operational deadlines. WKC qualified for the $400,000 incentive by completing the interim airfield ahead of schedule. The $360,000 incentive for sustained facilities under phase two was divided into five separate facility groups. To qualify for each incentive, all facilities in the group had to be complete by the date specified. A 10% late fee would be assessed for late completion. As a result, WKC completed some facilities four months ahead of schedule. For instance, the early completion of dormitories and latrines in the first group enabled the airmen to move from tents to hard facilities. This represents an important morale factor in a combat environment. Requiring WKC to complete each group by a specified date prevented minor construction deficiencies from being delayed (i.e., workmanship mistakes/punchlist items) until the very end of the contract for correction, a typical element in traditional construction projects.

EMPLOYEES OF PROJECT TURNKEY MUST NOT:

1. Participate in the religious or political affairs of Vietnam or get involved in discussions of such topics with Vietnamese citizens.
2. Assault, threaten, or use physical violence against Vietnamese or third country nationals except when bona fide self-defense is involved.
3. Exchange currency, scrip, money orders, or other forms of currency or dollar instruments.
4. Fail, upon arrival in Vietnam, to declare the amount of United States and foreign currency and dollar instruments in their possession or to deposit all their United States currency and dollar instruments in the Project Manager's office upon arrival at the job site.
5. Sell merchandise, personal property, or commissary goods.
6. Engage in any unauthorized or illegal business activity.
7. Carry or possess weapons.
8. Leave the job site without specific approval.
9. Attempt to bring dependents into Vietnam.
10. Obtain or use water or food from any source other than job site facilities.
11. Use narcotics or use alcoholic beverages excessively.
12. Import any of the following into Vietnam by means whatsoever: narcotics, marijuana, explosives, ammunition or fireworks, privately-owned firearms, Vietnamese currency in excess of 500 piasters, gold or silver bullion, obscene or pornographic literature, and printed matter advocating treason or insurrection against the United States or any country with which the United States has entered into a mutual defense or assistance program.
13. Engage in any activity or conduct in any matter which would degrade the image of the United States or which would have or tend to have undue inflationary effect upon the economy of Vietnam. (4:611-612)

Figure 1: The Labor "Code-of-Conduct" Used by WKC.

The final $140,000 demobilization incentive was established to gradually reduce the contractor's work force toward the latter project stages. This served two purposes. First, the civilian work force could be phased from the hostile environment. Second, and most importantly, WKC was prevented from saving extra workers to correct "punchlist" items at the end of the contract.

A well-developed base master plan and simplicity of design were instrumental in achieving the motto of doing the job right the first time. Strict control over temporary structures and maximum use of packaged systems, prefabricated buildings, and off-the-shelf materials were vital in this compressed construction project.

Project Turnkey clearly proved the Air Force capable of acting as construction agent for a major military construction project. The dramatic lessons learned highlighted a success story that could not have been completed without dedicated people. Air Force civil engineers were committed to completing the project on schedule, within funding constraints, and without degrading quality of the finished project. (6:2)

Future Application

With Project Turnkey completed in early July 1967, no similar construction effort was programmed for SEA, but not because the Air Force found the civilian contractor's "package deal" unsatisfactory. Rather, there was no further need at the time for a similar air base in SEA. (2:83)

Constructing Tuy Hoa air base using a turnkey approach fulfilled a specific operational need at a specific point in time. The turnkey approach was the best construction delivery system available to meet the need of a compressed construction schedule.

Although this achievement is 20 years old, today's Air Force civil engineers could conceivably be confronted with a similar problem in future limited conflict situations. The challenge to provide facilities for an entire air base may very well be presented. A similar situation to SEA—fighting a limited war without a formal declaration—could arise. We must face the realization of being confronted with a peacetime construction programming system to support wartime mission requirements.

To operate effectively will require flexibility and an awareness of the construction delivery systems available. Turnkey represents only one of the potential systems. Other options cover the spectrum from military troop construction to the traditional design-bid-construct to the more progressive design-construct approaches. Each system has specific advantages, disadvantages, and limitations in a combat environment. Civil engineers must carefully weigh the requirements and select a strategy using a construction delivery system that best meets the need.

Our predecessors showed what could be done on the sandy beaches of Tuy Hoa by aggressively plowing new ground in order to meet wartime needs.

Summary

Project Turnkey represents a historic milestone in the warfighting annals of Air Force civil engineering. The commitment of dedicated engineers toward supporting the operational mission needs of a growing air war was impressive. They transformed the barren beaches of Tuy Hoa into the most modern jet fighter base in SEA—all in less than a single year.

The warfighting attitude of these engineers serves as a reminder of what could be expected from the next generation of engineers in a combat environment. Many of the lessons learned from the turnkey application are not new, but the practical experiences learned are well worth remembering. In the next war, there will not be time to relearn the experiences of SEA. Therefore, today's engineers can refine their warfighting experience base by remembering what happened on the battlefields of SEA. Their motto for responsiveness is as appropriate today as it was over 20 years ago—"Do It Once—Do It Right."

Operating in 1970 from a permanent concrete ramp installation, a 431st MMS crew arms a Super Sabre nicknamed "Thor's Hammer."

Maj Tyley was an ACSC student when he wrote this paper.

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As a follow-up to "Logistics Under Fire—A Call for Combat Arms" (Spring 1987 issue, *AFJL*), recommend reading "Spetsnaz" in the August 87 issue of U.S. Naval Institute *PROCEEDINGS*.

The Maintenance Technician—A Lifeline to Reliability and Maintainability (R&M)

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Aircraft mechanics are a "lifeline" to enhanced maintainability. Lifeline because they are an umbilical between the flight line and the functions charged with R&M responsibility and efficient achievement of Air Force R&M goals. Within Air Force Systems Command (AFSC), maintenance personnel are motivated and qualified to assist program and test engineers in their challenge to develop increasingly reliable and maintainable weapon systems. Motivated? You bet! Besides the standard reasons for R&M (increased combat effectiveness, force multiplier effect, and other economies), aircraft mechanics have a personal stake in this program and are eager to participate. These professionals are intimately familiar with the harsh maintenance environment; the frustrations of poorly performing equipment, parts, or tools; and the difficulty of maintenance tasks on many weapon systems.

The Maintenance Technician's Responsibility for R&M

As an integral part of the AFSC test team, maintenance technicians are not only motivated but also bear special responsibility for R&M. First, they represent the skills and experience levels found in operational commands. Second, they are frequently the first of their kind to come in contact with a new weapon system.

The AFSC maintenance work force is made up of "blue suit" and government civilian personnel with a broad range of work experience. At the lower end, 3- and 5-level technicians verify maintenance repair procedures, techniques, and technical orders (TOs). At the upper end, senior noncommissioned officers and civilians offer the engineer a valuable data bank of experience on the practical application of R&M concepts.

The AFSC maintenance technicians' responsibility for R&M also stems from their proximity to new weapon systems and their close relationship with those responsible for development, test and evaluation (DT&E). At places such as Edwards AFB, California, and Eglin AFB, Florida, maintenance and munitions personnel interface daily with engineers, contractors, Air Force Operational Test and Evaluation Center (AFOTEC), and the using commands on a myriad of maintenance related research and DT&E issues.

An important reason for the early involvement of the maintenance technician is R&M efficiency. Figure 1 depicts the life cycle (design through operational capability) of a weapon system. Clearly, the earlier the weapon system matures, the better. We can either design it right in the first place or correct the deficiency during developmental or operational test and evaluation (OT&E). Unfortunately, undetected deficiencies in a fielded, operational system impair combat effectiveness and require expensive engineering change proposals.

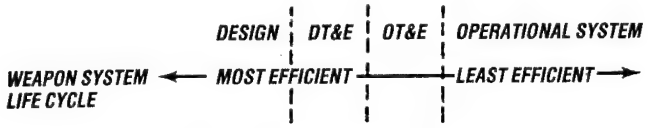


Figure 1: R&M Efficiency.

The Maintenance Technician's Role

There are two general categories into which the help provided by the mechanic can be grouped: support and direct actions. Support actions deal with coordination efforts, data collection, and reporting. Direct actions are primarily those functions involving "hands-on" R&M assistance.

One of the most important support actions the maintenance technician can provide is that of advisor or consultant to the contractor, program office, or, later, the test team engineer. In this coordination function, maintenance technicians make their most efficient input toward R&M improvements. This advisory role is the essence of the "Blue Two" program sponsored by the Air Force Coordinating Office for Logistics Research (AFCOLR), which exposes corporate managers and design engineers to "real world" maintenance environments and people. It allows direct interaction between designers and maintainers.

AFSC bases, because of their unique mix of aircraft, munitions, and electronic combat systems, are especially rewarding sites for Blue Two visits. For example, the 3246 Test Wing at Eglin maintains 15 different mission-design-series aircraft including F-4D/E, RF-4C, F-15A/B/C/D, F-16A/B/C, F-111E, A/YA-10, T-38, and UH-1N aircraft. In addition, Eglin's load crews must maintain certification on 111 different munitions from both standard and developmental inventories.

On 12 January 1987, the advantages of using AFSC bases as part of a Blue Two visit were realized when some 40 program managers and design engineers from industry visited Eglin to view missile/aircraft interface issues.[1] Here, and only here, could the group see checkout and loading operations on AIM-7, AIM-9, AIM-120, and AGM-130 missiles across a broad variety of tactical fighters. All members of the delegation thought the visit very beneficial.

AFSC maintenance personnel are hopeful the Blue Two program can be expanded to include another step. In this step,

the design engineer would, after having conceptualized some operational need, visit an appropriate AFSC maintenance organization before putting "pen to paper." This way the maintenance technician's thoughts could be considered up-front in the design process.

"The maintenance technician uses "comparability analysis" to assist the engineer."

The "Blue Two, Step Two" principle paid dividends in June 1986 when a Westinghouse engineer working on a classified pod program visited the Eglin avionics community. In this instance, the statement of operational need was in hand and the design process about to begin. The designer stated the visit was beneficial and the timing was perfect for his project. As a result of this "Step Two" visit, he made design changes to standardize screws and fasteners and simplify on-equipment boresighting. This is the crux of a mechanic's contribution in its most effective form.

Throughout the consultant phase of a support action, the maintenance technician uses "comparability analysis" to assist the engineer. Here, the technician relies on experience with a system type to offer recommendations for improvements which could be incorporated into the design of a new system or generate an engineering change proposal to an existing one.

Other support actions the maintenance technician provides include assisting the engineer in data collection; service reporting; and, in AFSC, "handing off" a test item to AFOTEC or the using command. Maintenance personnel assist the test engineer in recording mean time between failure/maintenance rates and fix or repair rates. Similarly, they report failures through service or deficiency reports (SR/DR) to program or item managers.

One recent example of this kind of maintenance support action involved the F-16 airborne self-protection jamming (ASPJ) system. Using a data collectors guide, maintenance technicians routinely assisted as members of the evaluation team and observed all test activities. As a result, 16 of 17 SRs were submitted by maintainers.

Besides these support functions, the maintenance technician also plays an important role in supporting the engineering community with direct or hands-on actions. One such action is fit, form, and function tests. Fit checks may be external or internal to the aircraft. The former most frequently involve a pod, dispenser, or munition. The latter may include different kinds of avionics, electronic or mechanical improvements, or new system capabilities.

"Some of the biggest problems Eglin's technicians have found are failure to use standard bolts, fasteners, and modular construction concepts."

The form of a new or improved system is also important. Is the "language" compatible with the rest of the weapon system? Does it cause a "hiccup" in another system? Is it metric or US standard? The maintenance technician assists the engineer in answering all these important questions. Thus far, some of the biggest problems Eglin's technicians have found are failure to use standard bolts, fasteners, and modular construction concepts.

After fit and form checks have been completed, the aircraft mechanic then assists the engineer in monitoring the proper functioning of the component in question. Through pre- and post-flight inspections, the technician reports failures and malfunctions to the engineering team.

A second direct action "assist" function is accessibility. Because almost every aircraft or munitions component will, at some point, require maintenance, accessibility should be preplanned. The mechanic offers a valuable input on physical location of components, pins, clamps, spacers, brackets, and a host of other accessories.

Aircraft mechanics are also an important data source on tools and support equipment. They have valuable insight into what does and does not work well. Standardization of tools and equipment, where possible or desirable, improves maintainability, eases deployability, and often reduces cost.

"Only use the right side." Fit, Form and Function testing for support equipment actually works. This AGM-130 missile cradle assembly had to be modified to ensure accessibility from *both* sides.

Almost any maintainer can give a real world example of how an innovative mechanic made or altered a tool to simplify a repair procedure. Since Eglin's maintenance technicians have focused their attention more keenly on R&M, several tool changes have been recommended. In one case, and pending Air Force-wide adaptation, a locally built tester for the F-16 is used to test matrix relays. In another, munitions load crews recommended design changes to a tool used for loading the BDU-48 practice bomb.

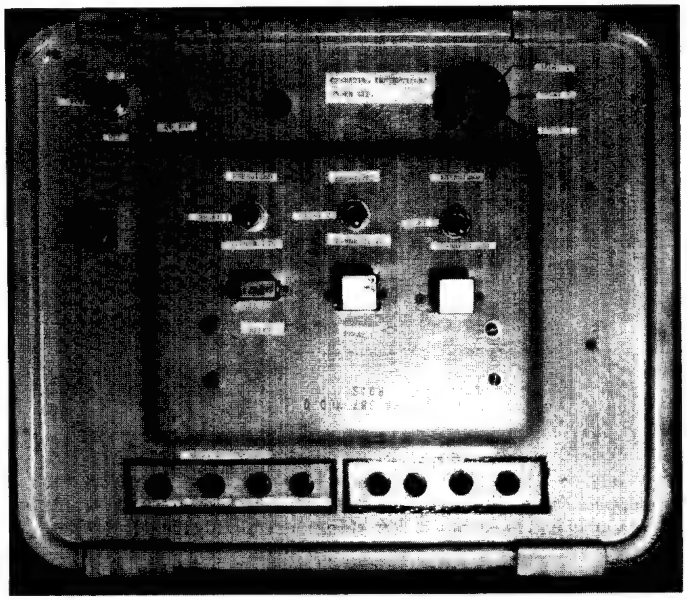
In addition, the aircraft or munitions mechanic is an important source for estimating initial spare requirements and for verifying TOs. The mechanic's experience, both prior to and during test and evaluation, is an important source for data and inputs to program managers and critical to fielding useful TOs. A TO which cannot be correctly interpreted by 5-level technicians in an operational environment is deficient and needs a rewrite.

The Technical Order Development Division under the 6510 Maintenance and Supply Group, Edwards AFB, California

(AFSC), has a significant responsibility for TO development. The division has 22 separate operating locations, including one in Europe, where a maintenance organization has oversight responsibilities for many airframe, munitions, and electronic combat TOs. An essential step in the development process is TO verification. Verification, in this sense, is when the "blue suit" maintainer uses the TO to ensure its accuracy, readability; and, most importantly, understanding.

A Maintenance Organizational Model

Motivation and defining roles are important first steps in integrating the maintenance technician into the R&M process. What must occur next is institutionalization of the process so it functions efficiently, continuously, and smoothly. Within a standard maintenance organization (centralized or decentralized), R&M overview is a logical function of *quality assurance*. This is true because quality assurance is already tasked with deficiency and service reporting, has a strong cadre of technical experts from many different specialty skills, and is not directly involved in production or maintenance support functions. Within AFSC, quality assurance (more specifically, the deficiency analysis section) provides overall program direction.



Maintainers are occasionally forced to install components merely to see if they work—a highly inefficient practice. As an alternative, a relay locally developed F-16 armament systems matrix relay tester gives the technicians the capability to "ops check" the system before installation, avoiding hours of frustration!

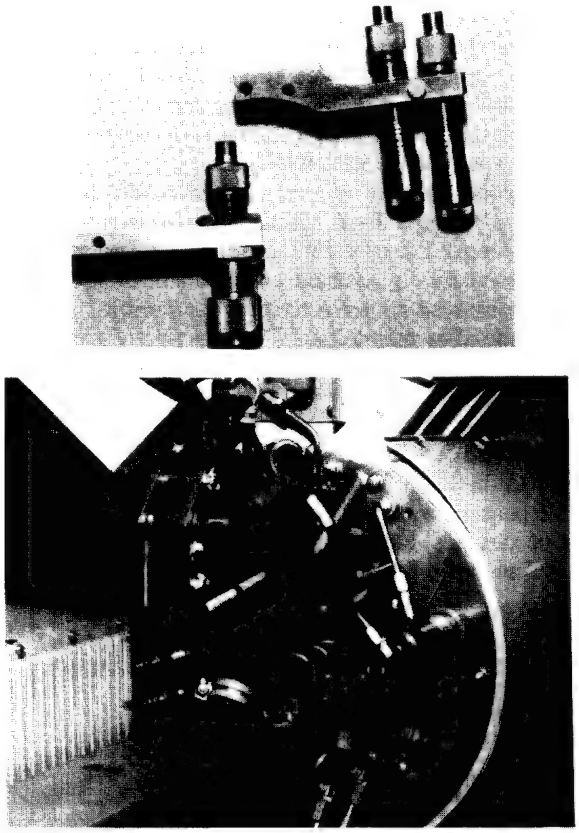
Deficiency analysis is responsible for liaison with R&M offices of both the test engineering and system program communities. They maintain R&M currency and directives, appoint and monitor project technicians, and brief R&M initiatives to the maintenance staff. This office also coordinates or hosts Blue Two visits (step 1 or 2) to the maintenance organization.

Within maintenance *production*, highly skilled technicians from one of four maintenance disciplines (organizational, field, avionics, or munitions) are appointed as lead project technicians for selected programs. The selection process is coordinated and based on many factors such as program classification, duration, available technical skills, and payback estimates. The lead project technician is given direct responsibility for assisting system program office managers or test engineers in all the support and direct actions previously discussed. At times, the complexity of the new system may involve multiple disciplines such as avionics and munitions. In this case, the lead project technician is expected to develop a "team approach." For example, a new guided bomb unit (GBU) may require several munitions skills (buildup, storage, load, and release) as well as avionics skills (sensors or radar). The lead project technician for a GBU (probably munitions) may select other skills to assist in making R&M inputs to the engineer or program manager.

Aircraft Maintenance and R&M

Maintenance personnel are motivated, have a role, and are organized to assist in the R&M process. Figure 2 combines those direct and support actions the maintenance community provides throughout the weapon system life cycle. Clearly, AFSC maintenance personnel bear a special responsibility toward R&M, but all maintainers share in the drive to obtain reliable, maintainable equipment.

The many R&M accomplishments of these maintenance technicians lend further credibility to their continued participation in this important program. The maintenance technician is as critical to sound R&M as the pilot tactician is to formulating new operational needs. Truly, aircraft mechanics are an important "lifeline" to achieving Air Force R&M goals.



A typical reliability improvement developed via the efforts of a maintainer to ensure the proper release of tow targets. The new, double cutter design (top right) virtually eliminated inadvertent tow target release deficiencies. The cutters are also shown installed in a tow pad (bottom).

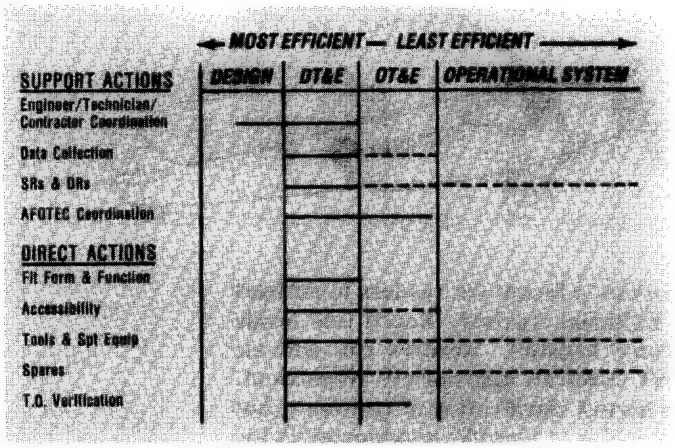


Figure 2: Maintenance R&M Responsibilities.

(NOTE: One could effectively argue about the actual demarkation shown in the figure. In some cases, commands other than AFSC may do work which might be classified as DT&E. Operational commands—one could argue—have fit, form, and function check responsibility over the lifetime of a "fielded" weapon system and do TO verification through recommended TO changes (AFTOs 22). The main points are: (1) do R&M early, (2) there are an abundance of things the maintenance technician can do, and (3) AFSC maintainers generally have an early on, weighted responsibility for R&M.)

Note

[1]The emphasis is only *part*, but an important *part*. Obviously, combat units should also be visited to see problems or good points of aircraft/missile interface dealing with combat turns, chemical warfare gear, or aircraft shelters. At Eglin, the presence of the 33rd Tactical Fighter Wing offers this kind of opportunity too.

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CAMS

Since 1983 the Air Force has been developing a new maintenance management information system to replace the old maintenance management information and control system (MMICS) and the maintenance data collection (MDC) system at base level. That replacement system, the core automated maintenance system (CAMS), has been implemented at 17 active duty units and a similar number of Guard and Reserve units. After some early growing pains, CAMS has proven itself to be a superb maintenance management tool which continues to improve as refinements are made. Two increments have been fielded to provide work order management: MDC and automated aircraft forms. More capabilities, such as automated debriefing, flying and maintenance scheduling, and maintenance supply interface, are still being added. Since CAMS is a user designed system, individuals can submit suggestions for improvement (Air Force Forms 1000 and 151) through their MAJCOM, to the Standard Systems Center. (Contact your MAJCOM CAMS monitor or Col John Kotzun, SSC/AQM, AUTOVON 446-4091.)

Warranty Guidance

SAF/AQCS and AF/LEYE are jointly developing an Air Force Regulation that will provide policy guidance and procedures for the development, administration, and enforcement of cost-effective and easy-to-manage weapon system warranties. The draft regulation (AFR 800-XX) was reviewed by the MAJCOMs and a warranty conference convened on 16-17 June 1987 to resolve their comments and recommendations. Final coordination should be completed in August, approval and interim distribution in September, and formal publication in November 1987.

▶ FROM 37

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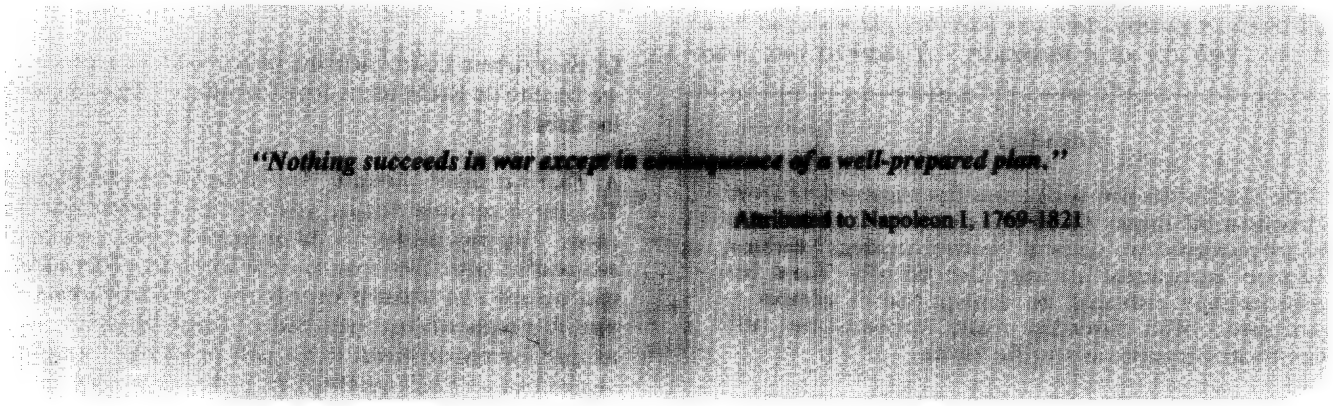
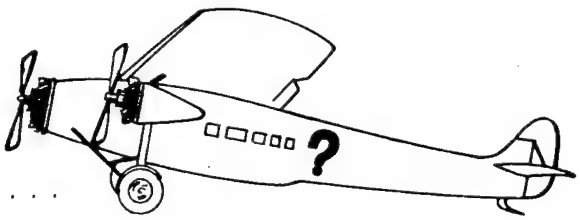


LOGISTICS ENQUIRER



Enquiring Loggies Want to Know . . .

The Logistics Enquirer section of AFJL provides a forum for readers to address important questions to the members of our Editorial Advisory Board (see inside cover) or other high-level leaders in Air Force logistics. Readers can address questions to specific individuals, or AFJL will select an appropriate respondent. Submitters should identify themselves so as to permit clarification of questions, but we will print only initials if so requested. Our goal is to provide an opportunity for dialogue on crucial issues facing the logistics community. Questions and comments should be broad enough to be meaningful over many months, yet specific enough to be responded to with facts and supportable policy or opinion. This issue contains some "pump primers."

Respondent: Brigadier General Richard D. Smith, DCS/Materiel Management, HQ Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio.

Q. Why are we involved with R&M 2000? It's been tried before and failed under different names.

A. Yes, it has been tried before and failed. It was tried when people and funding constraints were nowhere near as severe as they are today. It was tried during periods when the senior Air Force leadership believed that R&M problems could be bought out. It was tried when we had "known safe havens," safe rear areas, and sanctuary. Worst of all, it was tried when we thought that life cycle cost arguments would win over people who had perhaps 3-4 year tenures in positions that would not reap the benefits for 10-12 years. Get my message? Today the most vehement supporters of R&M 2000 are the Air Force operational community—folks like the TAC Commander and CINCSAC. The political consensus which supported substantial increases in spares funding has eroded away under the pressure of shifting national priorities, not the least of which is national debt, yet the threat growth remains unchecked. There is a different—and refreshing—discipline emerging where it counts with the users. They are balking at R&M levels in systems they may have to fight with that break with the "half life of a flashbulb." If there is one single change that has allowed R&M to succeed, it is the user who is saying: "Stop! Restructure! Get the R&M up!" Basic to this shift in thinking is the fundamental recognition that R&M is and always was "performance over time."

Q. Why is AFLC so deeply involved with R&M? Shouldn't that be the developing command's job?

A. Just look at the level of funding taken each year to support the existing force structure. Supporting the existing fleet, its manpower, tech data, facilities, spares, skill spreads, modifications, test equipment, and the infrastructure behind these requirements is literally suffocating Systems Command's ability to see a threat, develop a system and field it to meet and defeat the threat. Look what we did with the TR-1 and the EF-111. We strapped new capability on "antique" airframes. Somebody will have to pick up the tab for structural integrity, corrosion, safety, and reliability mods. The major message is we already have 80% to 85% of the force structure projected beyond the year 2000 "on the ramps" today. Doesn't it seem natural to concentrate on the existing force structure and maybe free up some bucks for development efforts? In fact this whole scenario is centered on the AFLC Commander's #1 R&M policy element: "Air Force logistics must shrink by design and direction in its consumption of Air Force resources." We simply can't afford to continue to "acquire" our way out of problems. That option, which we lived with for 20+ years, is passé!

Q. Everywhere I turn I hear the same old broken record, "Yes, we need to do R&M but it costs too much." How do we break the habit?

A. That's a super question. And today there are alternatives. You see it on your wrists; you buy it in stereo and camera shops. You buy quality based on performance over time at a reasonable cost. One way to kick the habit is to understand that we too can demand exactly the same performance over time at a reduced cost—yes, reduced cost. However, we need to spec our requirements in the only terms our "warfighters" understand—"PERFORMANCE"! We have seen too many

Editorial Note

The idea for this new section was first suggested by Lloyd Mosemann, AF Deputy Assistant Secretary for Logistics, after he had responded to a series of "leading questions" during a Bergamo management seminar. Our Editorial Board has enthusiastically embraced the concept and is anxious to participate. With favorable reader response, we will incorporate this section as a regular feature.

examples of well-thought-out requirements coupled with smart "win-win" business strategies deliver fielded reliability levels that have exceeded laboratory predictions. Yet, today, we still are plagued with a temptation to "derate" lab predictions by factors of 4-10 and hope that's what shows up on our flight lines. The "elixir" is technical literacy and knowledge about the innards of successful programs. We also are consistently sending the message to industry that we are serious about R&M. It started with the great fighter engine "war." Ponder the impact on corporate leaders when they see half of their fighter engine market share taken away by a hungry competitor. There was a time when that was the only example and all were wondering if it was a fluke of a precursor for the future. You begin to shuck tradition when you see a digital scan converter for the B-52 "speced" at 1500 hours and you get 4000 hours guaranteed in 13 months from program go-ahead to production at nearly half the cost of the old dog. Today we can count LANTIRN, ALR 74, F-111 AMP, B-52 OAS, ATF, SRAM II and dozens of subsystems managed by AFLC as profound success stories, marketed on performance-performance over time, and not life cycle costs. That's why we all need to turn up the wick on R&M. I can also tell you that the spares investments, intermediate maintenance costs, and people costs have been literally devastated at or below the costs of the antiques they replaced.

Respondent: Mr Lloyd Mosemann II, Deputy Assistant Secretary of the Air Force (Logistics), Hq United States Air Force, Washington DC.

Q. What do you see as the top priority or concern from a logistics perspective over the next 3-5 years?

A. Vision; salesmanship; credibility. Perhaps General Marquez said it best on the cover of a recent Journal: "When we reach into our quiver of airpower arrows, we must first draw those forged from brains—not mass, money, or more materiel!" At the next level of indenture, I would say the challenge of assimilating new technology, both in terms of equipments supported and in terms of production and management associated with the logistics processes. Also, we must become more concerned with productivity of the work force and make real paybacks to the general treasury. This will be one of the prices of the credibility we need to obtain the resources necessary to support the military mission.

Q. The technology resident in new and upgraded weapon systems is advanced to the point of often being beyond the capability of the Air Force to support. What is being done to put the AF on more solid ground technologically and to meet the greater technical demands of logistics?

A. There are three aspects of our activity that come to mind. First, we have now come much closer to the objective of designing weapon systems so they will not break and so they are easy to fix when they do. This is no small task. But every Acquisition Program Office now has this as a first-order concern. Source selections are being decided on the basis of these considerations. Both AFSC and AFLC now have very dynamic acquisition logistics organizations. And, both the Secretary and the Chief have made this a #1 priority through R&M 2000 and the assignment of a full-time, proactive general officer to spearhead the effort. Second, there is recognition that a major problem is software, and particularly the design and development of software for all the highly integrated computers which now comprise our weapon systems. The AF has established a $20 million per year Software Engineering Institute at Carnegie Mellon University and is leading the nation in an effort to make "software engineering" a recognized discipline through assistance to colleges and universities in establishing software engineering curricula. Finally, one could mention our emphasis on standardization, career development, space logistics and similar initiatives to assure we are prepared to cope with the twenty-first century.

Q. What are your feelings toward single source overseas repair vs at least one stateside source of repair? How does this affect supportability, especially under surge conditions?

A. Our policy is quite clear on this point: There must be a CONUS source of repair before we will establish an overseas source of repair. Normally, we repair overseas only those requirements which generate in-theatre. Exceptions may be made for some portion of the CONUS workload only if AFLC has determined that the source in CONUS can surge to support the total requirement in wartime.

Respondent: Major General Richard F. Gillis, Commander, Air Force Acquisition Logistics Center, Wright-Patterson Air Force Base, Ohio.

Q. Logistics Support Analysis (LSA) is one of the key tools of acquisition logistics. But, considering the high cost of including LSA on contracts, is our DOD dollar being well spent? (Andrea Wright, AFALC/ERL)

A. The precise cost of applying LSA to a contract is difficult to come by. LSA dollars are considered to be up-front dollars, and past experience has taught us that, if we are unwilling to spend these up-front dollars, logistics support cost will amplify several times as the program matures. A hardware fault, detected by LSA, can be corrected comparatively inexpensively early in a program, but the same correction would be an expensive, time-consuming modification for a mature system. Over the years, we've collected many examples of where the process has really worked, saving the Air Force millions of dollars over the life cycle of a weapon system. LSA is the best way we know of today to optimize a design for supportability and minimize required support resources.

Q. Standardization, particularly in the area of support equipment, seems to be expensive to achieve. Why the push for it? (Paul Feltz, AFALC/LSE)

A. There is more cost to consider than just acquisition cost. To manage and store the spares and technical data takes warehouse space, manpower, and data processing resources—all of these cost dollars. Proliferation of support equipment also causes mobility constraints. During wartime, airlift capacity will be at a premium. We need to reduce the requirements for airlift where practical. The bottom line is rational standardization with a look at the overall picture, life cycle cost with peacetime and wartime constraints.

Respondent: Colonel Charles E. Roberson, DCS/Logistics, HQ Air Force Systems Command, Andrews Air Force Base, Maryland.

Q. In acquisition and logistics there are a number of "ilities," including reliability and maintainability, that have come into vogue. Are there other "ilities" with which you are concerned?

A. Certainly reliability and maintainability are crucial as we design and build new weapon systems and support equipment. We must field systems that are reliable in the first place and that we can, in fact, maintain in a combat environment. But there is another "ility" that can be just as crucial: transportability. It is important that, during early stages of the design and development of new systems, the basic question of "Can we move it?" be answered. Unfortunately, there are too many examples of serious transportability problems uncovered after an item has been designed and built—problems that, in fact, limit our ability to move items from where they are to where they are needed. Fortunately, resolving the problem is frequently fairly easy, if it is addressed early. The AFSC transportation staff is the designated Air Force focal point for air transportability questions, whether the concern is air or surface transportation. This is an area upon which we will continue to place great emphasis.

Q. Why does the transportation community continue to promote the use of contract airfares for official travel when there are cheaper non-contract fares available?

A. Contract airfares are, in fact, a contractual agreement between the government and the carriers. In simplest terms, we have agreed that in return for reduced cost fares we will require government travelers to use the contract carrier over a specific route. There are exceptions that permit use of another carrier when the contract carrier's schedule, for example, does not meet the traveler's mission requirements. But, in general, we use the contract carrier because there is a contractual obligation to do so. There are several other points to consider when talking about the contract airfare program. First, it is important to remember that these fares are guaranteed for a year and can be extended for up to another year at the government's option. They are not subject to change in the same way that most of the other "discounts" are. We find that most of the deep discounts normally require 30 or more days' advance purchase and have cancellation and other penalties and restrictions. The contract fares have none of those restrictions. Second, it can also be argued that the contract airfare program has played a major role in creating and maintaining the competition that has resulted in the large number of non-contract government discount fares. In a competitive, deregulated environment the program has permitted the government to have some control over the price we pay for transportation. It continues to pay big benefits to the Air Force, resulting in millions of dollars in reduced travel costs.

Respondent: Brigadier General (Maj Gen Sel) Edward R. Bracken, DCS/Plans and Programs, HQ Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio. (Gen Bracken has left this post to assume duties as HQ USAF/LEX.)

Q. Are logistics decisions being made at the right level?

A. Actually, I believe there is too much micro-management in the logistics area. For example, even within the Air Force Logistics Command, we at the Headquarters are, I believe, too much involved in the day-to-day operations of our air logistics centers. The Headquarters should set policy and obtain resources, but leave execution of that policy to the centers. I recognize this tendency towards micro-management is not peculiar to AFLC—that Congress would be more than happy to tell us how many of each widget to buy. I recognize that this is due, at least in part, to a perception that we need all the help we can get. My attitude is that you should give a person a job and hold him/her accountable. If he/she proves inept, you don't do his/her job; you replace him/her with someone who is competent.

Q. Are you happy with the way maintenance is scheduled and accomplished at AFLC's centers?

A. Not completely. I think that right now we are still a little too obsessed with "repairing what we negotiate" and this could become a problem in a wartime environment. I believe we have recognized this deficiency, however, and are taking steps to correct it. We are testing a new approach in our avionics repair shops at Ogden. The repair workload for these avionics items is being driven by current shortages, weapon system availability goals, and projected near term need. The whole idea is to increase the flexibility and responsiveness of depot maintenance and distribution so we will be better able to help the operational forces fly the required peacetime and wartime sorties.

Supporting Deployed Forces with the Combat Supply System

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No modern commander would go into combat without a supporting logistics system. But that is exactly what happened in the last major conflict.

During the Vietnam war, we supply experts thought we had the parts-chasing business all figured out. We had a big, new UNIVAC 1050-II computer that enabled us to push parts around any base with amazing accuracy, speed, and ease. Our senior managers' confidence in our abilities was at an all-time high. Unfortunately, unknown to us, we had become too dependent on the computer to do much of our work.

Our leaders decided the Vietnam war could not be fought entirely from large main bases so we moved to a bare base forward location. However, we could not take our lifeline—the computers—to these austere locations. The reality of the situation hit us hard. Our usual speed and accuracy were gone. Long hours and labor-intensive manual operations now became the norm. Support of the Air Force mission was deteriorating rapidly, and accountability of assets was almost impossible. Something had to be done to ensure mission support improved. A program was then developed to build computer facilities at 13 operating bases. U1050-II computers were leased and installed. Military maintenance personnel were trained by commercial means and a large cadre of computer operators and maintainers moved into the theater to begin normal supply support similar to peacetime operations. Because this was a very costly situation, leaders were determined to find another means of support.

Shortly after the Vietnam conflict ended, several published reports identified a need for a deployable supply computer which evolved into the Standard System Center's (SSC) Combat Supply System (CSS).

The Beginning

The road toward identifying the need and fielding an operational system was a long and bumpy one. From the initial reports, we initiated a prototype communications Computer System Requirements Document (CSRD) in 1976 to develop and test a prototype for a deployable supply computer. Development of the Supply Automated Mobility Supply System (SAMSS) prototype (forerunner of the present day CSS) was completed in late 1977 and tested in early 1978. The major commands validated the results and the HQ USAF Directorate of Maintenance and Supply certified the functional baseline for transition purposes. This baseline represents the essential wartime processes existing in the CSS today.

Although we had demonstrated the ability to perform essential war-time processes, the inability to sustain the automatic data processing equipment (ADPE) acquisition process was almost the undoing of the entire CSS project. During the ten years between conception and fielding, the Air Force tried several different acquisition strategies including a DOD standard requirements contract sponsored by the Marine Corps and a joint acquisition with the Army.

"The CSS allows supply people to take a computer into forward areas with complete confidence the system will work."

Finally, in December 1984, the first Burroughs B-26 computer was delivered to the SSC at Gunter AFS AL, and the modern CSS was born. Just 14 months after delivery of the first computer, the CSS was sent to the Team Spirit 86 exercise in Korea and performed better than anyone expected during a first deployment. We learned valuable lessons from this, and from many more successful exercises.

Since that first deployment, the CSS has changed much and traveled on numerous deployments. The CSS of today is vastly different from that first system used in Korea. Yet, they share one very important thing in common: the CSS allows supply people to take a computer into forward areas with complete confidence the system will work.

What Is a CSS?

Two very important features make the CSS computer well suited for deployments—redundancy and survivability.

Redundancy starts with the CSS hardware. A single CSS consists of one master and six work stations, two printers, two 85 Mbyte hard disks, dual floppy diskette drives, and a magnetic tape drive. Once deployed, if something happens to the master (or any other) central processing unit (CPU), it could be replaced with any of the remaining six CPUs. This same feature is true for any of the keyboards or visual display units (VDU). If one of the printers should malfunction, the system could continue with one. Although there is only one magnetic tape drive, the very fact a tape drive was included is redundant. The tape and floppy diskette drives are both alternate means of storing images to later update the Standard Base Supply System (SBSS). These methods are used when the preferred CSS to base supply interface, which is through telecommunications (modems), is not available. The CSS also has a built-in plan for total system failures. While deployed, a series of reports are run each day which produce enough information to start a manual supply operation. Therefore, even if the CSS completely failed in a deployed location, the reports used to start a manual operation would be more up-to-date than previously available.

Redundancy is only one of the advantages to CSS. The CSS is also a very survivable computer system. Before the first CSS was deployed, the computer was subjected to what are affectionately termed the "shake and bake tests"—varying degrees of temperature, humidity, altitude, vibration, and drop tests. For example, the system was operated in temperatures of 120 degrees and dropped from heights of 24 inches. Throughout these (and many other) tests, the system continued to perform efficiently. While such treatment is not recommended for just any computer, the reason for subjecting a CSS to these tests was to prove its ability to survive the unknown.

Physically, a CSS looks like—and for the most part is—an off-the-shelf Burroughs (B-25) computer. Yet, there are some significant differences, such as special filtration that forces outside air through a filter before it passes through and cools the system. This cuts down on damage to the system while operating on dirt floors or under dusty conditions.

What Does It Do?

Reduced to its simplest terms, the CSS automates the storage, issue, and receipt of all assets at a deployed location. In order to accomplish these three main tasks fully, the CSS has evolved into a much more complex system than was originally envisioned. Complexity results from the number of different scenarios the CSS is programmed to accomplish and from the need to interface with the SBSS.

Predeployment

While in garrison, the CSS is used only for training. Prior to notification of a deployment, all software should have been loaded. Also, the deploying organization should have notified supply what they intended to take. If these actions are done correctly, a record of the needed items is in the SBSS's computer. Supply makes a copy of these records on a magnetic tape and codes the corresponding details deployed. When loaded to the CSS, this tape becomes the starting point for all CSS balances.

"Almost anything a supported organization can take on a deployment can be loaded to and accounted for in the CSS."

Almost anything a supported organization can take on a deployment can be loaded to and accounted for in the CSS. This includes small throwaway (expendable) parts, such as springs, O-rings, and flashlight batteries, or large recoverable due in from maintenance (DIFM) items like aircraft brakes, instruments, and generators. It also includes any kind of equipment such as test stands, voltmeters, and vehicles.

The prepared tape can be immediately loaded to the CSS or carried by the deploying unit and loaded to a CSS once at the deployed location. The ability to deploy with this tape is critical to the CSS concept. There are only 131 CSS systems in the Air Force, not nearly enough systems for each unit with a deployment commitment to deploy with one. CSS plans call for several units to share a single system at many deployed locations. Originally, the CSS was required to support three deploying units. Today, depending on the size of the unit, the CSS can handle many more.

Available CSSs are assigned to units which will arrive at a deployed location first. Units arriving later at the same location will bring their own tape and sufficient load information. As they arrive, they give the tape and load information to the CSS boss who loads it to the CSS. Some examples of load information required are organization codes, owning and support base account codes, and communications routing identifiers. Since the CSS must have this information to operate correctly, it is important for deploying units to plan ahead and have this information readily available.

Deployment

In a deployed location, the CSS takes the place of base supply. Many of the inputs, outputs, and internal records look exactly as they would at home station. Organizational needs are reported to the supply people working in the CSS by the maintenance technicians. The supply people input issue requests through a CSS terminal the same way they would at their home station. Many of the normal inputs a supply technician would see in the SBSS account are available through the CSS with most of the same formats. In fact, one of the biggest advantages in operating a CSS is how closely it resembles the home station base supply. This closeness makes training and the CSS to SBSS interfaces much easier.

Each time supply issues an item, the CSS is programmed to reorder the item used automatically (if desired). The ability to resupply automatically enables units with a CSS to stay in a deployed area for longer periods of time. Supported organizations can request any item through a CSS, including those items not originally brought with them on the deployment. In order to do this, they simply request the item the same way they would if they were at their home base.

To keep everyone's balances separate, the CSS uses a Combat Unit Designator (CBUD). This designator allows automatic issues to deployed organizations for only those assets they brought. If a deployed unit has a need for an asset they did not bring with them and another unit supported by the same CSS does, the CSS is programmed to provide a management notice to the CSS supervisor. At this point, it is up to local management to decide if the asset should be released to the requesting organization.

The CSS keeps track of how many items are used at the deployed location. This information could be extremely useful when deciding what items and how many of each to bring on future deployments. For example, if an organization deployed for 30 days and took 50 widgets with them and used only 2, they might want to decrease their authorization for future deployments. Conversely, if the same organization did not take a certain item with them but used 10 of them, they should think about getting more authorized for future deployments. The CSS tracks consumption on individual items and by organization. In the near future, the CSS will produce a report highlighting each of these shortages and overages.

Interface

The CSS can be used in a truly stand-alone mode. In other words, no transactions would be passed to the SBSS and resupply of items used would not take place while deployed. Requisitions to the support base would only be submitted for items that ground major systems.

If we decide to resupply as items are issued, requisitions and/or transactions are passed by the CSS to base supply. This

passing action is a big part of the CSS to SBSS interface. All transactions that affect a balance in the CSS create an output record that is stored until the CSS supervisor elects to process the interface. This can be done several times each day, once a day or less frequently as desired. The supervisor also decides what method will be used to transmit this data to the supply account. Magnetic tapes, floppy diskettes, and an electronic interface (modems) could be used, depending on the situation.

After the decision is made for the CSS to interface with the SBSS ("pass" transactions and resupply for all issues), other decisions must also be made. The original magnetic tape containing all CSS balances may be loaded to a nearby SBSS. If this option is used, we call this base our "owning" base because we have transferred accountability from our home station. Depending on the deployed location, we may (or may not) be resupplied from our own base. If we are, the owning base is also our support base. We could just as likely receive support from an entirely different base. In all cases, the base we go to for support is called our support base. In all situations, the tape used to upload balances on the CSS comes from the owning base, not necessarily our home station. If we have transferred accountability, our owning base is the base supply to which we just transferred accountability. A transfer of accountability does not have to occur. If we do not transfer accountability, resupply can come from any base in the deployed area or from our home base. The CSS has been programmed to send requests for resupply to any supply account.

A single CSS can support a large number of deploying units, with each one having a different home, owning, and support base. The CSS will keep all balances separated by CBUD and organization code and will send enough information to the correct base for replenishment and/or to update all accountable records.

Improvements Over the SBSS

Although the CSS is smaller and newer than the SBSS, it has been vastly improved over the SBSS and in many ways is easier to use. The CSS's users and operations manuals are loaded on the system and released with each new software release. These manuals are a complete copy of AFM 67-1, Vol II, Part Five, *Combat Supply System (CSS) Procedures,* and AFM 67-1, Vol II, Part Six, *Combat Supply System (CSS) Operations*. They may be accessed from any CSS work station and may be viewed on the terminal, or printed for later use. Having all the documentation loaded with the software enables us to make changes much faster than the SBSS. It also means that deploying personnel do not need to bring bulky manuals with them. This capability eliminates the need to post changes or worry if documentation is current. Anytime a question arises during CSS processing, the supply technician can access a CSS functional help screen. These screens provide enough information to process all inputs or, as a minimum, provide the correct manual reference to get the needed information. Most CSS programs have a refresh screen capability. This allows multiple inputs with a vastly reduced number of keystrokes. This option is extremely useful when the supply technician has a large number of like inputs to process. Using the refresh option, all the technician needs to do is retype any columns that change from the previous inputs.

Most CSS improvements were accomplished to make the CSS easier to use for the people deploying. However, some improvements were made out of necessity. Weight was one of the biggest concerns with the CSS. Weight was considered for everything done on, with, or to the CSS. When packaged in its transit cases, the system weighs about 950 pounds. However, a big weight consideration was the amount of paper that must also be deployed with the CSS. Therefore, when programming the CSS, the elimination of printed output was a very high priority. When processing a file interrogation (inquiry), the output will automatically be to screen with an option to print. Additionally, rejects that can be reprocessed on the CSS do not create an output document as it would on the SBSS. To clear rejects on the CSS (using screen refresh), all one needs to do is change those characters that are wrong, eliminating the need to retype the entire input again.

There are many other advantages of the CSS over the SBSS. The CSS has an automated transaction history inquiry. This inquiry can print all transactions that have occurred for the duration (or any part) of a deployment. Unlike standard base supply inquiries that simply produce raw data, CSS inquiries have headers for all data elements. CSS programs also have what is termed a 001 reject phrase capability. For many types of general errors, the CSS will provide a 001 reject instead of the more familiar standard base supply reject. For example, if the supply technician input an issue and accidentally used a numeric unit of issue, the CSS would return him to the input screen and flash two arrows under the incorrect field. Advantages of CSS 001 rejects instead of the normal supply rejects include immediate feedback, readily identifiable errors, and much faster reprocessing.

Summary

One can summarize the CSS with just three words: "It works well!" The CSS automates what a very short time ago was a slow and very difficult manual operation. But, the CSS is more than just automation. It provides numerous capabilities never before available at forward locations.

The initial CSS concept (programming document) is over ten years old, even though the first system has only been in the field for a year. The SBSS and the mission of deploying units have changed many times in ten years. The CSS has been able to keep pace with these changes and has successfully supported every deployment on which it has been used. New concepts are being proposed each day that no one thought of ten years ago. In order for the CSS to keep supporting deployments, it must continue to be updated.

The CSS is a new system and very few people really understand how it works. Formal training must be instituted to relieve some of the training burden currently falling on unit supervisors.

The CSS has taken the deployed supply operation into the computer age. It is easy to use and has many improvements over the SBSS from which it was originally designed. It also provides speed and accuracy never before possible. With all of its advantages and proven performance, the CSS is continually being updated to meet requirements of the Air Force of tomorrow.

Notes

[1]CORONA HARVEST Report on USAF Logistics Activities in Support of S.E. Asia, August 1970.

[2]GOA Report, "Need to Identify ADP War Time Readiness Needs in Europe," February 1976.

[3]AF Readiness Initiatives Group Biannual Report on Readiness, July 1976.

CURRENT RESEARCH

Air Force Logistics Management Center - FY86 Program

Periodically, the Logistics Management Center contributes to this portion of the Journal. Our last contribution appeared in the Spring 1986 edition. Many of the projects in that listing have been completed, and we sincerely hope the Air Force logistics community is more effective because of them.

Cooperative efforts outside the Center have been outstanding. Students and faculty members at Air University and the Air Force Academy provided significant inputs to our projects. Other personnel from MAJCOMs and bases have helped by providing "real world" data, test-bed sites, survey participants, "sounding boards" for new approaches, and key recommendations on better ways to solve logistics problems.

If you are interested in any of these projects, please contact the project officer. If commercial lines are used, dial Area Code 205, 279-plus the last four digits of the AUTOVON number.

1986-87 Projects

Base-Level Award Fee Contract Guide
Objective: Develop a "how to" guide that bridges the gap between traditional base contracting methods and the more sophisticated incentive contracting approaches authorized by federal acquisition regulations.
Capt Coffin, AFLMC/LGC, AUTOVON 446-4085

Base Contracting Officer Handbook
Objective: Develop and publish a handbook that provides (in generic terms) the role of a base-level base contracting officer, functions and responsibilities of that officer, necessary interaction and interface with other base-level functional areas, and guidance on daily management and supervisory responsibilities.
Capt Daley, AFLMC/LGC, AUTOVON 446-4085

F-110 Engine Tracking System
Objective: Based on the original Minimum Essential Engine Tracking System (MEETS) prototype for the F-100 and TF-34 engines, support not only deployable engine tracking but also provide an interface capability between the contractors' ground support software and Maintenance Management Information Collection System (MMICS). F-110 MEETS is currently operational in USAFE and PACAF.
Capt Fandre, AFLMC/LGM, AUTOVON 446-4581

Personnel Analysis Evaluation Program
Objective: Develop a flexible software package to allow quality assurance (QA)/deficiency analysis to analyze QA personnel evaluation inspection results with features which identify and forecast negative personnel performance trends.
Capt Baysinger, AFLMC/LGM, AUTOVON 446-4581

F-15 Computerized Fault Reporting Evaluation Study
Objective: Provide an independent evaluation of contractor demonstrations of the F-15 computerized fault reporting (CFR) study. Demonstrations are to be held at two CONUS F-15 bases approximately seven months after contractual authorization. The evaluation will measure the impact of computerized fault reporting data on the maintenance debriefing function.
Capt Gemas, AFLMC/LGM, AUTOVON 446-4581

F-220 Engine Tracking
Objective: Based on the original MEETS prototype for the F-100 and TF-34 engines, support not only deployable engine tracking, but also provide an interface capability between the contractors' ground support unit and MMICS. F-220 MEETS is currently operational in TAC and AFRES.
Capt McKnight, AFLMC/LGM, AUTOVON 446-4581

Tactical Missile Record System
Objective: Develop a user-friendly microcomputer program executable on the Zenith Z-100, Z-248, and Sperry PC computers. This program will meet base-level and higher headquarters requirements. It will also be integratable into the combat ammunition system (CAS). The program will provide base-level managers with visibility and control of inventory, inspection, time change, time compliance technical order (TCTO), scheduling, and configuration data. It will also allow for reporting appropriate data to higher levels (MAJCOM and depot) for monitoring.
Capt Taylor, AFLMC/LGM, AUTOVON 446-4581

Requirements Determination Processes for Consumable Assets in War Readiness Spares Kit (WRSK)
Objective: Develop a standardized methodology of computing WRSK authorization levels for consumable assets.
Capt Burleson, AFLMC/LGS, AUTOVON 446-4165

Demand Forecasting for Reparables
Objectives: Evaluate the stockage and operational impacts of forecasting the mean and variability of demand for repair cycle assets. Determine accuracy of current method and evaluate alternatives.
Maj Matthews, AFLMC/LGS, AUTOVON 446-4165

New Activation Spares Support Level (NASSL) Procedures
Objectives: Investigate the current Standard Base Supply System (SBSS) method of computing NASSLs. Analyze and quantify the stockage performance of the NASSL process. Develop and test alternative methods of generating initial spares lists for the support of a new unit activation.
Capt Reynolds, AFLMC/LGS, AUTOVON 446-4165

Automated Inventory Analysis Program for Base Supply
Objective: Develop a microcomputer package to retain monthly inventory adjustment data for in-depth analysis and provide base-level managers the statistical tools necessary to analyze the inventory data.
Capt Antalek, AFLMC/LGS, AUTOVON 446-4165

Retail Logistics Distribution Process
Objectives: Systematically evaluate the current base-level repair process and recommend improvements where needed. Review repair process work flow and identify conflicting policy and procedural guidance in maintenance, supply, and transportation. Eliminate duplicative steps and streamline where possible. Review documentation requirements, eliminate redundancy, and simplify and integrate where possible.
Maj Matthews, AFLMC/LGS, AUTOVON 446-4165

Supply Wartime Requisitioning
Objectives: Develop a comprehensive and coherent policy for supply wartime requisitioning of spare parts. Identify potential problem areas and recommend solutions.
Capt Burleson, AFLMC/LGS, AUTOVON 446-4165

Freight Documentation Automation (FDA) Packing and Crating
Objective: Automate freight documents in the Packing and Crating section of the base-level Traffic Management Office. This system also provides an automated method of capturing and reporting Traffic Management Workload Reporting and Productivity System (TWRAPS) information.
Capt Wasem, AFLMC/LGT, AUTOVON 446-4464

Automation of DD Form 1387-2
Objective: Streamline the process of researching, creating, and printing the DD Form 1387-2, Special Handling Data/Certification Label. It provides for more efficient mobility processing of hazardous cargo which will be moved by air.
Capt Wasem, AFLMC/LGT, AUTOVON 446-4464

Functional Description for War Reserve Materiel (WRM) Vehicle Management System
Objective: Develop a Functional Description for an automated WRM vehicle management system to provide accurate management information on a timely basis and reduce administrative workloads. Produce a detailed system design document to identify programming requirements and constraints as input to a follow-on programming effort.
Capt Van Scotter, AFLMC/LGT, AUTOVON 446-4464

TO 25 ▶

Trends in Data Automation and Implications for the Air Force

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Introduction

Information is a critical resource for the Air Force. Having the right people, the right equipment, and the right procedures to control this resource is essential. In its daily business, the Air Force uses automated systems to manage nearly every aspect of military operations—from command and control, to surveillance and warning, to accounting and finance. When changes occur in data automation, they affect every Air Force member. Understanding key trends in this field will make tomorrow's leaders more aware of potential impacts on Air Force programs and people.

Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force,* states, "Men alone, or machines alone, do not spell success: how men use machines in the combat environment, and the spirit of leadership that guides that use, spell victory or defeat." (18:2-4) How the Air Force uses computer systems to enhance its potential for victory on the battlefield largely depends on trends which influence these systems. Perhaps the best motivation for understanding data automation trends is the linkage between the wartime mission of the Air Force and the automated systems supporting it.

US ICBMs, for example, while controlled by dedicated men and women, are constantly monitored with sophisticated computer systems which provide fault detection, security status, and the means to execute the single integrated operational plan (SIOP). On the tactical side, every pilot knows the value of the fire control systems, avionics packages, and threat warning systems in a combat environment.

Military forces throughout the world have experienced this dependence on automated systems in the transition from peace to war. The British, in the battle for the Falklands, understood this relationship. They, like us, could not mount a massive amphibious task force with little notice without a computerized logistics system capable of controlling the rapid assembly and movement of massive quantities of troops and stores (2:200-204). Tomorrow's conflict, as the British verified five years ago, will be a "come-as-you-are war"; future AF leaders need to recognize that the Air Force will enter the next war with the same systems used in peacetime.

The task of examining trends in data automation is, indeed, a formidable one. The previously stated excerpt from AFM 1-1, however, serves to enhance the discussion. Basic doctrine identifies three important areas: people, machines, and leadership. Concentrating on a few key trends in the data processing field which affect people, technology, and management should provide some insight into the man-machine-leadership combination which culminates in enhanced warfighting capabilities.

People—The Critical Resource

How many people are really in the automated data business in the Air Force? How many officers? How many enlisted personnel? Are there too many? Are they trained? The next few paragraphs address these questions by describing trends associated with the people who support Air Force automated systems.

Numbers of People

The task of supporting Air Force automated systems rests with a small, highly technical group of professionals: system managers, program managers, systems analysts, programmers, operations specialists, and many others.

In 1984, according to figures reported by the Defense Manpower Data Center, the Air Force had over 10,600 officers and enlisted personnel assigned against data processing specialties. This small cadre of automation professionals represented 1.8% of the total Air Force personnel resource. The Army and the Navy/Marines had 0.5% and 1.0%, respectively, of their total personnel assigned in similar specialties. (24)

Military data processors are, thus, concentrated in the Air Force. In fact, the Air Force has 76% of the officers and 40% of the enlisted personnel assigned within DOD in these specialties. Within the Air Force itself, officers comprise over one-third of the uniformed automation resource.

Private Sector Comparisons

Dedicating just under 2% of its personnel resources to data processing puts the Air Force in line with the private sector. According to the latest published summary by the Bureau of Labor Statistics (1978), the finance, insurance, and real-estate industries allocated 2.2% of their total work force against data processing specialties which included systems analysts, computer programmers, and computer operators. By interpolating between the Bureau's actual employment figures and its 1990 projections, the 1983 estimate for these industries would be approximately 2.7%. Similarly, the air transportation industry would employ 1.6% of its people in data processing fields, while the communications industry would employ 2.2%. (21:24) In effect, the Air Force, which at that time used 1.8% of its personnel in data processing jobs, mirrored the private sector in computer related employment.

There are, however, serious implications for the composition of the future work force. The Bureau of Labor Statistics predicts four of the five fastest growing occupations

through the 1990s will be in the data processing fields. (14:Table 3) Nationwide, there will be 1.8 million computer programmers, systems analysts, and computer operators by the end of the 1980s, compared to 1.1 million during the 1970s. This 60% increase represents a significantly increased demand for these computer occupations in the private sector. (21:22)

Demand for software professionals is precipitated by a seemingly insatiable thirst for software products. The Electronics Industries Association (EIA) predicts a 12% per annum increase in the demand for software in the Department of Defense alone. This equates to an estimated shortage of about 1,000,000 software professionals for the nation by the year 1990. (15:30)

"Computer related training within the DOD is concentrated in one area of computer science—programming."

Implications for the Air Force are twofold. First, a similar increased demand for highly qualified data processing professionals will occur. (13:54; 14:Table 1) Second, competition for the same resource with the private sector will intensify. With the advent of legislation to balance the federal budget, any possibility for increased manpower has further diminished. While this quantity factor in the equation may be beyond control, an alternative for meeting tomorrow's demand for highly qualified people is through the quality factor, training.

Training—The Quality Factor

There are really two aspects of automated systems training: specialized training for data processing professionals and for all users of data processing equipment and technology (a much wider audience).

Each new breakthrough in computer technology places a new training requirement on current computer professionals. The current core of professionals represents the designers, operators, maintainers, managers, and controllers of critical computer resources. In a highly technical industry where changes occur daily, one could question whether the training provided has been adequate.

"With the advent of fourth-generation languages, the days of the classical computer programmer are numbered."

A recent examination of training for data processing professionals identified a key problem which directly affects Air Force automation capabilities. Computer related training within the DOD is concentrated in one area of computer science—programming. (1:25) While programming is certainly an essential component of automated systems, other tasks also demand the data processing professional's time and expertise. The critical tasks in acquiring new systems will be in the design, specification, quality assurance, configuration management, and acquisition management areas.

Computer programming, itself, is changing in character. New fourth-generation languages were created to allow nonprogrammers easier computer access and also to greatly speed up the programming process. The characteristics of such languages typically include the use of a data base management system, emphasis on a user-friendly approach, ease of training, and nonprocedural code. (3:31-32) With the advent of fourth-generation languages, the days of the classical computer programmer are numbered. Disciplines such as systems engineering, data base engineering, and computer networking offer tomorrow's challenges. Aggressive training in all these areas should be a high priority.

While training is a key element in developing data processing professionals, training for the general user population may present a more serious challenge. The rapidly expanding computer inventory is affecting every Air Force specialty. Computer literacy courses, especially for managers, have been lagging far behind demand. Early in 1986, the Honorable Richard E. Carver, Assistant Secretary of the Air Force for Financial Management, specifically targeted senior leadership for ". . . education in the use of automated data processing as a management tool." (5:8) In fact, in 1985, the Air Force had already begun an intensive effort aimed specifically at that target. This effort, Project Bold Stroke, focused on four key objectives: (1) awareness among senior leadership of problems and initiatives dealing with Air Force software programs, (2) development of formal education and training courses, (3) improvements in personnel management of software professionals, and (4) development of a future plan for the Air Force's automated data processing (ADP) force (15:29-30).

Fortunately, besides these Air Force initiatives, universities, secondary, and even elementary schools are introducing computer usage as an integral part of their curricula. Tomorrow's officers, airmen, and civilian employees will be better versed in automated systems capabilities than before. This, however, will place a heavier burden on the data processing staff to provide sophisticated services and products.

And sophisticated they will be! Every data processing professional will need to remain current in the latest computer developments; computer users certainly will. Both current and projected demands for complex software are far beyond most organizations' ability to support them. (3:5-6) One possible alternative to satisfying these demands is by exploiting new technologies, creating a better man-machine link.

Technology

Pick up a Sunday newspaper or a weekly news magazine and chances are good there is an article on computer technology. Advances are occurring daily and trying to describe all the trends in computer technology would take volumes. However, advances in software development and computer security may shape the future of the automated systems organization and its people.

Software Development

Tools such as fourth-generation languages are projected to produce significant increases in programmer productivity. As an example, Burrough's Linc system improved one company's productivity to the extent it is now used in everything from design to report generation. Maintenance of existing systems took between 30% and 35% of the staff's time. With Linc, estimated maintenance time is now about 5%. (6:30) Maintenance of applications systems consumes a large portion of an organization's data processing resources. Surveys by

"50% of an organization's software activity is spent on maintenance."

Datamation and individual observations by data processing managers and industry analysts have consistently estimated that 50% of an organization's software activity is spent on maintenance. (17:108) The use of fourth-generation languages and associated data base management systems will have a significant impact on data processing support activities.

Another significant development in software is in the area of knowledge engineering. This is a subfield of artificial intelligence which attempts to solve problems by replicating human decision logic. (8:11-28) Potential military applications abound. The techniques could be applied to routine tasks of data correlation and fusion, intelligence, planning, financial decision-making, and wargaming. The only limit on the capabilities of knowledge-based systems is the amount of human intelligence incorporated into the decision models. The concept is simple—simulate to the desired extent the logic used in making decisions. The implementation is complex, requiring highly sophisticated design skills, skilled functional operators, and a well-trained quality assurance staff.

New software technologies create some serious challenges. Air Force managers must be able to evaluate new systems and satisfy requirements. They must ensure the integrity and control of extremely complex, state-of-the-art automated systems. Also, they must simultaneously ensure the information processed and the systems themselves are protected from unauthorized access.

Computer Security

More than any other group, the military services require strict security in controlling their automated systems. This control, however, has been complicated with the advent of computer networks. In a sense, computer networking and security attempt to achieve conflicting goals. Networking attempts to make information from various sources available to a user quickly, efficiently, and in a familiar format. Freely sharing information is the network's objective. On the other hand, security stresses access rights and need-to-know. Limiting information to those with a need-to-know is the objective of security.

The urgent need for new security measures has created a lot of design activity. There have been 11 publicly documented attempts to develop "trusted systems"; i.e., systems or computer components that can be relied on to enforce a particular security policy. Sixteen additional projects have been sponsored by the services, the National Security Agency, and the Defense Advanced Research Projects Agency. (10:90-93)

How extensive is the security problem? While the military computer systems are among the best protected, data on unclassified systems are extremely vulnerable. These data include key project management information, logistics data, and data on military personnel, operations, and locations. Compound this vulnerability with the opportunity for expanded access through networks and tomorrow's automated systems managers face some serious control problems. (11:30-37)

Control of automated systems, however, is achieved through management. Effective management will allow new technologies, such as software development tools and proven computer security procedures, to be implemented easily and quickly. An appropriate management philosophy is critical to any organization's success, particularly when facing rapidly changing technologies.

Management

In the past, the Air Force approach to managing automated systems has emphasized centralization. In 1983, recognizing the need for a corporate management approach to information systems as a whole, the Air Force combined data processing, communications, and office automation staffs at the Air Staff level and formed the Assistant Chief of Staff, Information Systems. The new organization focused on three areas: organization, procedures, and personnel. Organizationally, it provided guidance for the integration of computer resources, telecommunications, and office automation functions at the major commands and separate operating agencies. Procedurally, it developed standards and architectures for information systems, writing new 700-series regulations. The primary personnel goal was the consolidation of the communications and computer specialties. (4:45-46; 7:6)

Early in 1986, the name of this new organization was changed to the Assistant Chief of Staff, Systems for Command, Control, Communications, and Computers. Senior Air Force leaders wanted to describe the functions of the new organization more accurately, emphasizing the contribution to warfighting missions. Functional responsibilities remained the same with a focus on organization, procedures, and people. (20:19-1 - 19-4)

"Decentralization of automated systems responsibilities can be a double-edged sword."

Following this same approach in early 1987, the Secretary of the Air Force directed the realignment of the information systems management function, formerly a part of the Assistant Secretary for Financial Management. This function was consolidated with the oversight of command, control, and communications systems, located within the Assistant Secretary of the Air Force (Acquisition) (22:1)

Perhaps the most significant aspect of this reorganization was that the Air Force created a corporate structure to do top-level strategic planning of automated systems. Air Force leadership had recognized information as a critical resource.

The current trend in industry, however, is to decentralize the planning and implementation of computer support systems. Traditional data processing responsibilities are assuming less and less of the total organization's automated systems activities. An increased user demand for services has caused functional areas to begin developing their own capabilities in graphics, engineering automation, scientific computing, office automation, and both minicomputer and microcomputer applications. In some corporations, the central data processing organization is now responsible for only a fraction of the entire automation budget. (12:7)

Decentralization of automated systems responsibilities can be a double-edged sword. Some advantages include:

(1) Dispersing computer experts throughout the organization, thus better matching functional requirements with automation techniques.

(2) Encouraging experimentation and innovation in developing new automated applications.

(3) Fostering the enforcement of automation standards throughout the organization, including providing continuous feedback on standards.

(4) Enabling management to guide the evolution of automated systems while encouraging local innovation.

On the other hand, potential problems include:

(1) Tendency to develop specialized, one-of-a-kind system, thus eliminating potential economies of scale.

(2) Functional manager's time lost in dealing with automated systems matters, which could be handled more effectively by experts.

(3) Increased reliance on certain data processing professionals to possess diplomatic and teaching skills.

(4) Difficulty of controlling the overall automated systems program.

(5) Tendency to forget the need for a coordinated, strategic plan for automated systems. (16:163-164)

"The question of centralized or decentralized control of automated systems is critical to the Air Force."

Private industry has responded by providing direct support to end users through information centers. Typically, these centers provide a variety of services, including microcomputer applications, hardware selection, software selection, and training. (3:Ch 7) The federal government has also capitalized on the approach. The General Services Administrations's computer "store" did over $5 million worth of business in just six months, providing federal departments with hardware and software for specific needs (9:61). The Air Force established its own version of information centers for microcomputers, the Small Computer Technical Centers. Within each major command these centers provide central consulting services, software exchanges, and guidance for user-developed microcomputer applications. (19:3)

The question of centralized or decentralized control of automated systems is critical to the Air Force. Congress requires strict accounting of automated resources, and a centralized policy, planning, and standards approach at the Air Staff level is certainly prudent. However, the user needs the ability to acquire or develop new systems quickly. Decentralizing these acquisition and development responsibilities to the user also seems wise.

Decentralization is not a new approach, but a well-recognized one now applied to the Air Force's automated resources. Indeed, a glance at AFM 1-1 shows that the principles of centralized control and decentralized execution are at the core of the employment of aerospace power. (18:2-20) Similarly, in his memo on the Management of the DOD Planning, Programming, and Budgeting System, Deputy Secretary of Defense Frank C. Carlucci reiterated the same approach of centralized policy direction and decentralized execution. (23:2) The management of automated systems now requires the same logical approach.

Summary

Examining the previous key trends in the data automation field raises some definite concerns. Challenges in manpower, technology, and management will have tremendous impacts on how the Air Force acquires, manages, and operates its future information systems. In turn, these future systems directly affect combat capability.

Air Force data processing professionals are members of a small group, no larger than similar organizations in the private sector. Private industry, whose growth rates for employing computer professionals have outpaced the military's, will be aggressively competing for these personnel resources. Based on employment projections, the Air Force will face severe competition recruiting and retaining tomorrow's computer specialists. From a quality standpoint, training within the military is concentrated primarily on only the programming aspect of computer science. Today's managers need more training in planning, acquiring, and controlling automated systems.

In addition, advances in technology, particularly in software development and computer security, will revolutionize data processing activities. User developed software, new fourth-generation languages, and knowledge engineering challenge the very existence of the computer programmer. Computer security has become an important issue in assessing the vulnerability of unclassified systems as well as those that process sensitive information. This emphasis on security will demand more attention from the data processing staff in the future.

Finally, in industry, the management of automated systems is undergoing a metamorphosis from monolithic control to a system of decentralized responsibilities. In the Air Force, while users can certainly assume more responsibility for their applications programming and maintenance, policy development and strategic planning still require a centralized automated systems support staff. Without this type of centralized control, the results would be duplication, lack of standardization, and inefficiency. The prudent management approach is to centralize the planning function, but decentralize the execution.

As members of a highly technical organization which relies heavily on computer systems, Air Force must remain aware of current automation trends. Trends affecting manpower, technology, and management can create serious problems or they can create opportunities. Only through awareness of the potential implications of automation can the Air Force wisely plan tomorrow's automated systems. We will, indeed, go to war with the systems we use in peace.

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▶ *FROM 20*

Reception Guide for Transportation Officers
Objective: Provide an information guide for use by transportation officers in preparing for and receiving deployed forces.
Maj Byrd, AFLMC/LGT, AUTOVON 446-4464

Analysis of Reception Requirements and Procedures for Forces Deployment
Objectives: Identify deficiencies of the present reception process. Prioritize enhancements for further study and implementation.
Capt Fuller, AFLMC/LGX, AUTOVON 446-3355

Contingency Operations/Mobility Planning and Execution System (COMPES) On-Line Base-Level Logistics Module (LOGMOD-B) Computer Aided Instruction System
Objectives: Develop a computer aided instruction (CAI) system to teach base-level logistics planners how to use the on-line COMPES LOGMOD-B. Ensure the CAI developed is compatible with training programs developed by the Logistics Plans officer and enlisted technical training courses. Ensure the CAI is released before or at the same time as the on-line COMPES LOGMOD-B.
SMSgt Petersdorf, AFLMC/LGX, AUTOVON 446-3355

Pulling the Chocks

It has been my honor and pleasure to serve for the past thirty months as Editor, Air Force Journal of Logistics. I have been privileged to work with people and issues reaching across the full spectrum of combat support functions, and been afforded a panoramic view of the complex support structure that provides strength and depth to US and Allied airpower.

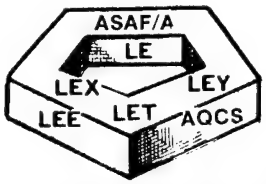
This structure is in the midst of sweeping change brought about by shifts in the nature of warfare. If we ever again become embroiled in major warfare, we will for the first time be unable to overwhelm opponents with logistical mass churned out by an invincible industrial base. For the first time, our air bases and the linkages between them will be at risk and under attack from the air, ground, and perhaps even within. It will be the first time our technological edge will be relied upon so heavily to compensate for loss of mass and sanctuary. These changes will for the first time cause the logistical structure to engage in warfare, not just support it.

The good news is that we've got the brainpower, insight, and will to meet the challenge. The evidence has presented itself even in the pages of AFJL where, hopefully, the science of logistics and art of warfare coalesce. That's the main purpose, as I see it, of our professional military periodical. I hope we've made strides in this direction over the past months.

I am pleased to introduce readers to AFJL's new Editor, Lt Col Mike Rigsbee. His credentials as a logistician and writer are impressive and formidable, with heavy emphasis in the international logistics arena. Please extend to him the tremendous support given me. He will ably guide the AFJL with the continued dedicated and expert help of Assistant Editor Jane Allen—to whom it would be impossible to express enough appreciation.

God bless,

Dave Rutenberg



USAF LOGISTICS POLICY INSIGHT

Hazardous Materials/Waste Shipments

Management of hazardous materials/waste shipments has become highly visible both at the congressional level and in the public sector. Several incidents recently occurred involving low-level radioactive waste shipments, destined for disposal facilities, which violated the Code of Federal Regulations and Federal and State Environmental Protection Agency rules. The Air Staff, working jointly with the Air Force Radioisotope Committee (AFOMS/SGPR), has issued interim controls to prevent further violations. A new regulation to establish Air Force policy to manage these items, AFR 19-11, *Hazardous Material and Waste Management,* is currently being staffed. This regulation, in conjunction with AFR 161-16, *Control of Radioactive Material,* will provide policy/procedures for the Air Force Hazardous Material Waste Management Program. The seriousness of rules violations, even though they may appear to be minor, cannot be overemphasized. Penalties for violations can range from fines to imprisonment, or both. (Mr Ted Sparks, AF/LETTC, AUTOVON 227-4742)

Procedures for Intermodal Containers

The trend away from breakbulk shipping makes the Air Force increasingly dependent on intermodal containers for distribution of supplies and munitions. Since the probability exists for moving these containers by both surface and air, procedures for shipping, handling, and receiving must be developed. The Air Force Intermodal Systems Development Group (AFISDG) is the Air Staff focal point to ensure an efficient capability exists to containarize military cargo and munitions in accordance with International Organization for Standardization requirements. The AFISDG provides a forum within the Air Force to manage development and implementation of procedures for airlift, traffic management, transportability, handling, and packaging of, military cargo in intermodal containers. Air Force Regulation 75-26, *AF Containerization System Development Group* (expected revision this summer), assigns responsibilities to all major commands for developing procedures for container movement during peacetime and in response to contingencies. It promulgates Department of Defense (DOD) direction formulated in DOD Directive 4500.37, *Management of DOD Intermodal Container Systems,* 2 April 1987. (Maj Steve Carroll, AF/LETTC, AUTOVON 227-4742)

LOGEX System

A major transportation initiative to improve the mission capability of US forces based in the Continental United States is the Logistics Express (LOGEX) system. LOGEX is scheduled for implementation 1 January 1988 and is designed to provide next-day delivery of essential material from the five Air Force Logistics Command air logistics centers to mission bases or between mission bases. LOGEX is a transportation triad of dedicated aircraft, commercial express services, and dedicated trucks. The largest segment (dedicated airlift) is presently known as Logistics Airlift (LOGAIR) and employs the use of contracted commercial air carriers. The LOGEX system will have revised LOGAIR routes and enhanced processing concepts to expedite cargo transshipment through the major air terminal hubs at Hill, Kelly, Tinker, Robins, and Wright-Patterson Air Force Bases. The cost of the LOGEX system will be similar to today's LOGAIR system. However, faster transit times will improve the combat readiness of United States Air Force units. (Mr John Ware, AF/LETTC, AUTOVON 227-4742)

T^3 Strategy

The Air Force established a Tool Tiger Team (T^3) to address common hand tool proliferation and enhance intermediate and organizational (I&O) level flight line maintenance. The T^3 strategy includes defining future hand tool requirements, developing necessary acquisition system guidance changes, and capturing the common hand tool list in a military handbook. The handbook will be specified in the acquisition process for use by the designers of future weapon systems in the development of I&O level maintenance concepts. When fully implemented, the T^3 strategy will reduce the number of tools in an average composite tool kit to less than a dozen on the flight lines of tomorrow. (CMSgt Chambers, AF/LEYY, AUTOVON 227-1177)

MILCON Funding

The Air Force is proposing a new strategy for military construction (MILCON) funding which will prevent the funding of new mission construction programs (e.g., advanced tactical bomber and small ICBM) at the expense of the physical plant revitalization program. We are actively seeking Office of the Secretary of Defense (OSD) and congressional support for this new strategy. Previously, overall funding levels for MILCON were developed with little regard for revitalization impact. The total MILCON appropriation remained relatively fixed, at about $1.5 billion, throughout the mid-1980s. But because new mission MILCON requirements vary from year to year, the revitalization funding profile has been uneven. With a fixed "topline," revitalization funding paid for new mission bills. As a result, the FY88 budget request allows the Air Force to revitalize facilities just once every 160 years. If the fixed topline remains as new systems come on line, the revitalization cycle will approach 300 years. New strategy focuses on revitalization MILCON. It establishes a steady stream of funding (or "baseline") for revitalization and allows the MILCON topline to rise and fall with new mission requirements. Since the existing physical plant deteriorates and becomes obsolete at a steady rate, new strategy provides funding to counter deterioration and obsolescence—to revitalize the physical plant—at a steady rate. (Mr Jay Janke, AF/LEEPD, AUTOVON 225-8940)

TO 13 ▶

View from the DPML: Performance and Supportability

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"One falls to the ground in trying to sit on two stools."

Francois Rabelais

The art of establishing and maintaining the necessary balance between military striking power (operational performance) and the elements needed to sustain and maintain that power (logistics) has been debated and studied from many perspectives. Rather than enlarge the body of theoretical literature, we attempt in this article to isolate a particular interface between performance and support, study it from the perspective of a practitioner population segment, and offer some suggestions toward building a single "stool" which offers a comfortable seat to all. Our starting place is early in the system acquisition process, when decisions are being made to determine how new weapons will perform and be made as reliable and simple to fix as practical. Believing the acquisition community is already applying sufficient emphasis to achieving acceptable *operational* performance, we concentrate on efforts of the *logistics* community to influence new system design and ensure the most effective blend of reliability and maintainability (R&M) with operational capability.

Setting the Stage

In 1981, then Deputy Secretary of Defense Frank Carlucci enunciated eight management principles paramount in the development and acquisition of new systems. One is:

> Improved readiness is a primary objective of the acquisition process of comparable importance to reduced cost or reduced acquisition time. Resources to achieve readiness will receive the same emphasis as those required to achieve schedule or performance objectives. Include from the start of weapon system programs designed-in reliability, maintainability and support.[1]

Implicit in this statement is recognition of our past failures to give proper attention to logistics effects and the resolve to correct the situation. To do so, it is necessary to identify the major constraints to designing the optimum level of "supportability" (an expression we use to mean the combination of "reliability, maintainability and support"), determine their relative significance, and develop methods to reduce the more significant constraints.

In addition to the Carlucci pronouncement, regulatory and organizational changes have implemented new acquisition policy and reinforced the conviction that more early emphasis on support design is needed. In 1972, the congressionally directed Commission on Government Procurement (COGP) report recommended numerous changes to acquisition contracting procedures.[2] In 1974, the Office of Federal Procurement Policy, which centralized the responsibility for contracting policy in the government, was established. In 1976, OMB Circular A-109, incorporating many of the COGP recommendations, placed more emphasis on design concepts in terms of mission needs and established clear lines of authority for program managers.[3] In 1980, three DOD Directives (DODD 5000.1, DODI 5000.2, and DODD 5000.39) applied new emphasis to supportability in the early acquisition phases and made it an item of interest in milestone reviews and funding decisions.[4]

In January 1985, Secretary of Defense Caspar Weinberger realigned selected Office of the Secretary of Defense (OSD) organizations and functions in order to ". . . clarify responsibilities, strengthen controls, and provide emphasis for certain program areas which should receive additional attention."[5] The position of Assistant Secretary of Defense (Acquisition Logistics) was established. This decision integrated within OSD the responsibility for the acquisition management process with oversight of functions, facilities, and resources that support weapon systems.

One must conclude there has been widespread recognition of past shortcomings in designing supportable systems. As a result, changes have been mandated and mechanisms for improvement have been established. But are they enough? Have the changes effected the desired improvements? Do the people who must do the job see a clear road ahead? In the development and acquisition of Air Force systems, the person who has the responsibility of representing the logistics community is the deputy program manager for logistics (DPML). Working through a system program office (SPO) as a full-time member of the development team, the DPML is expected to influence the program manager (PM) to treat supportability as comparable in importance to performance. We asked a number of DPMLs at two of Air Force System Command's (AFSC) product divisions what constraints they perceived and what further improvements they would recommend. In response, they still see some roadblocks, and they recommend some actions to help clear the way.

Surveying DPMLs

A quick review of the environment in which the DPMLs function may help to put their opinions and recommendations into perspective. The typical SPO is designed to find and develop a solution to a validated current or projected operational deficiency. The SPO explores concepts, studies

*(presently a student at the Defense Systems Management College)

and validates possible alternative solutions, and then manages the development and initial production of the new system. It is the only organization authorized to negotiate with the development contractor; therefore, it is the focus of all Air Force management and direction. The DPML is usually either a field grade officer or an equivalent grade civil servant assigned by the Air Force Acquisition Logistics Center (AFALC) to serve as a full-time working member of the PM's staff and represent the logistics community as the advocate for supportability. The DPML has a unique relationship to the PM as a deputy responsible for managing the development of the support system, under the PM's direction, while representing another Air Force command with a separate reporting chain to Air Force Logistics Command (AFLC) superiors. It is only through the SPO, however, that design influences can be realized, so the logistician can be effective only if accepted as a positive force and a productive working member of the SPO.

Since reliability and maintainability are widely accepted as the primary design attributes affecting system supportability, we conducted an extensive literature review and identified seven major constraints to achieving R&M goals. These constraints represent those that recent authors and senior DOD and Air Force officials indicated were significant problems.

The study presented had two objectives: (1) to determine how DPMLs ranked and perceived the impact of these constraints, and (2) to elicit the DPMLs' opinions on how best to resolve the constraints. The first part of the study addresses the DPML ranking.

Constraints on DPML Performance

The constraints were randomly arranged so as not to unduly influence the ratings. In addition, a short definition was given for each constraint, and the respondents were encouraged to read all the definitions and the entire survey instrument before making any judgements (Figure 1). A rating scale was provided to allow discrimination among the seven constraints and each respondent was asked to rate them all by giving each a position on the scale according to its impact and ranking (Figure 2).

Of the 32 DPMLs assigned to major programs at the two selected product divisions, 28 were available for survey completion and interview. The personal interview method was selected since the small population size dictated the need for a very high response rate. In addition, the respondents would be more apt to vocalize opinions than to take the time to write them; further, their opinions would likely be more candid.

We had assumed the respondent population would be homogeneous in terms of their level of experience in acquisition logistics. In fact, a wide variation in levels of experience was discovered. This led to a decision to categorize the respondents into three concentric groups for purposes of analysis. The first group included the entire 28 respondents. The second group included the 15 people in Group 1 who had three years or more total acquisition experience. The third group included the ten people in Group 2 who had one year or more experience in the early phases of system development to include the early portion of full-scale development. Table 1 summarizes the demographic composition of the three groups. By dividing the respondents into these groups, it was possible to determine if the differences in their experience levels were of any significance.

To determine how the sample DPML population would rank order the given constraints, the individual ratings for each

CONSTRAINTS TO IMPLEMENTING R&M INITIATIVES

A. *REQUIREMENTS DEFINITION:* Inadequate definition of logistics design parameters in early program documentation. (Examples: Ambiguous statements of need; poor early definition of logistics goals.)

B. *RFP EVALUATION CRITERIA:* Inadequate weighing of logistics issues in evaluating contractor proposals. (Examples: Insufficient logistics representation on source selection committees; failure to convince contractors that support issues are equal to cost and performance issues; lack of contract incentives to reward logistics design achievement.)

C. *LOGISTICS R&D:* Insufficient emphasis on developing and applying new logistics technologies. (Examples: Lack of communication with the Coordinating Office for Logistics Research and Development and with the Human Constraints Division of the Human Resources Laboratory.)

D. *ORGANIZATIONAL STRUCTURE:* Dual chain of command may split DPML loyalty. (Example: Difficulty of being an acquisition "team member" in the performance/supportability trade-off process.)

E. *DPML AUTHORITY:* The lack of decision-making authority. (Examples: No control over the funds which assure a supportable design; limited to an advocacy role in design trade-offs.)

F. *TRAINED PERSONNEL:* Failure to employ experienced and trained logisticians. (Example: Assignment of mostly inexperienced personnel to the SPOs; rapid personnel turnover; lack of meaningful training opportunities in the necessary logistics techniques and skills.)

G. *TEST AND EVALUATION:* Inadequate supportability T&E. (Examples: Poor definition of government and contractor responsibilities; inadequate funding; lack of training in logistics test design.)

Figure 1.

RATING SCALE

All constraints will be ranked on this one scale. Please indicate your judgement of the impact each constraint has on R&M in a development program. Be sure that each hash mark is identified by the letter of the constraint it represents.

Figure 2.

DEMOGRAPHIC COMPOSITION OF RESPONDENTS

Grouped by:		Group 1	Group 2	Group 3
Product Division	ASD	16	10	6
	ESD	12	5	4
Grade:	05/GS14 and below	23	10	7
	06/GS15	5	5	3
Experience in Early Phases:				
	Less than 1 year	16	5	--
	One year or more	12	10	10
Overall Acquisition Experience:				
	Two years or less	8	--	--
	Three years or more	20	15	10
DPML Experience:				
	Less than 1 year	11	--	--
	One year or more	17	15	10

Group 1: Total Population
Group 2: 3 years or more acquisition experience
Group 3: Members of Group 2 with at least one year's experience in early development phases

Table 1.

constraint were quantified by measuring the distance in millimeters from the bottom of the scale to the respective subject's hash mark rating.

The Statistical Package for the Social Sciences (SPSS) was used to calculate the group means from the individual scores. The constraints were then listed by magnitude of the mean ratings. The responses were analyzed by group and by product division. The analyses assumed that the underlying population distributions were normal and the variances near-equivalent. Other research has shown that most opinion surveys approximate a normal distribution. (Even when the distribution differs, the statistical tests are relatively unaffected.)[6] Tables 2 and 3 display the resultant constraint rankings by group.

CONSTRAINTS AS RANKED BY ALL DPMLs (GROUP 1)

Rank	Constraints	Mean
1	Requirements Definition	65.5
2	Trained Personnel	59.8
3	RFP Evaluation Criteria	51.3
4	Logistics R&D	43.4
5	Test and Evaluation	35.3
6	DPML Authority	34.6
7	Organizational Structure	21.6

Table 2.

CONSTRAINTS AS RANKED BY THE MORE EXPERIENCED DPMLs

	Group 2		Group 3	
Rank	Constraint	Mean	Constraint	Mean
1	Requirements Def.	63.7	Requirements Def.	66.2
2	Trained Personnel	61.9	Trained Personnel	63.9
3	RFP Eval. Criteria	50.8	RFP Eval. Criteria	52.3
4	Logistics R&D	41.8	Logistics R&D	42.6
5	Test and Eval.	37.6	Test and Eval.	41.2
6	DPML Authority	31.9	DPML Authority	26.0
7	Org. Structure	24.3	Org. Structure	21.1

Table 3.

COMPARATIVE RANKINGS OF ALL ASD AND ESD RESPONDENTS

	Aeronautical Systems Division		Electrical Systems Division	
Rank	Constraint	Mean	Constraint	Mean
1	Requirements Def.	62	Requirements Def.	70
2	Trained Personnel	60	Trained Personnel	59
3	RFP Eval. Criteria	52	RFP Eval. Criteria	51
4	Logistics R&D	47	Logistics R&D	39
5	Test and Eval.	39	Test and Eval.	37
6	DPML Authority	34	DPML Authority	29
7	Org. Structure	23	Org. Structure	19

Table 4.

As can be seen by comparing the rankings, all three groups agree on the rank order of the seven constraints. This indicates DPMLs, regardless of experience, have a generally uniform perception of the relative impact of those seven constraints impairing their ability to influence the system's design for improved supportability. While none of the differences in the rated means were found to be statistically significant, some interesting trends existed among the groups. Group 2 rated the constraints *Trained Personnel* and *Test and Evaluation* higher than Group 1, and Group 3 rated those constraints even higher. Conversely, the more experienced respondents placed a decreasing emphasis on the constraint *DPML Authority*. Display of the constraint rankings by product division reveals

no difference of the perceived sequence of the impacts (Table 4).

"Inexperienced managers rated the constraint DPML Authority significantly higher than their more experienced colleagues."

The constraint generating the widest range of opinions (largest standard deviation) within both product divisions was the perception of the impact of *DPML Authority*. A comparison between the least and most experienced managers showed the relatively inexperienced managers rated the constraint *DPML Authority* significantly higher than their more experienced colleagues. This difference in perceptions seems logical since the newer personnel may lack the skills, reputation, and rank which enable the more experienced people to do their jobs regardless of the lack of a formal power base.

Resolving the Constraints

The second and key research objective was to elicit respondents' opinions on how best to resolve the constraints. The solutions are summarized and discussed in the order of impact chosen by the total group.

Requirements Definition

Requirements Definition was the constraint listed as most important, but was perhaps least discussed in the presentation of solutions. The consensus was that, in recent years, the Air Force has made important strides in correcting this deficiency and the primary concern was this emphasis should continue. Several DPMLs emphasized the importance of mandatory early working conferences with the system's users to establish logistics requirements and goals. Also suggested was early baselining of logistics requirements and strict controls over changes to those baselines.

Trained Personnel

Trained Personnel ranked second highest in perceived impact. Of all the issues, the respondents spent more time offering specific solutions to this than to any other. This was the issue on which they generally agreed they could see the least movement and improvement. Their suggested solutions fell into four natural groupings: overall management of the career field, development of a comprehensive training program, specific educational goals, and alternatives to reduce the amount of training required.

(1) Most respondents indicated the need for a separate Air Force specialty code (AFSC) for acquisition logistics, or at least a distinguishable shredout of only one AFSC by a prefix or suffix. The expected benefits would be an ability to identify which individuals are experienced in acquisition logistics and the assignment of a career manager who would be responsible for the professional development of the career field. Many felt that specialty identification would go far toward reducing the high turnover rate and that acquisition logistics would be recognized as a unique career field requiring specialized skills.

(2) The development of a comprehensive training program would begin with the determination of which skills are needed in the management of acquisition logistics and culminate in a master plan for providing opportunities for developing those skills. This is another initiative which the AFALC has already undertaken.

(3) There were a number of suggestions on specific educational goals. Not surprisingly, they tended to reflect the differing perceptions of DPMLs in small and large programs. Those in small programs, seeing the need for their staffs to operate across a functional spectrum, tended to suggest general management courses. Those in larger programs, since they could allow their staffs to specialize, wanted more specific logistics skills taught. All of them admitted they found it difficult to release their people to attend courses and stressed the attractiveness of short courses. When asked to specify which subjects should be covered, most suggested their technicians needed about two-thirds emphasis on logistics skills and one-third on business strategy. For DPMLs, the split should be half and half.

(4) Several alternatives were offered to reduce the amount of training necessary. Ten of the DPMLs offered the idea of developing special teams to help SPOs when projects require specialized skills. Since these skills are sometimes needed only once in a program or for a short time, it is inefficient to train for that one event and unrealistic to assume that most will learn the skill well enough to employ it effectively. Generic checklists were another suggestion to help guide the implementation of new techniques without formal training. This is an initiative already undertaken by the AFALC. Service contracts and frequent DPML conferences were also recommended. By negotiating support contracts with firms having established logistics teams, the Air Force could operate with fewer trained and experienced logisticians. More frequent DPML conferences would, it was suggested, improve the communication of the important issues in acquisition logistics.

Request for Proposal (RFP) Evaluation Criteria

Several recommendations dealt with *RFP Evaluation Criteria,* but, overall, the respondents generally believed the Air Force has made significant recent improvements in this area. Seventeen respondents suggested changes which were grouped into three areas: use of a source selection cadre, development of better RFPs, and continued encouragement for program directors to be responsive to logistics issues.

(1) The argument for source selection cadres centers on the belief that a group selected and trained to do the job and, given the opportunity to gain experience through participation in several source selections, would perform more effectively and efficiently than do the largely ad hoc groups brought together under the present system.

(2) It was also recommended that the current emphasis on quality RFPs be continued and intensified. The contractors must know specifically what is wanted and evaluators must have clear criteria against which the contractors' proposals may be measured.

(3) The final suggestion dealt with the need for program managers to be kept aware that logistics must be considered an equal partner to operational performance throughout the development.

Logistics Research and Development

All the respondents who offered solutions for increasing the emphasis on developing and applying logistics technology

recommended logisticians be placed in laboratories as catalysts for the process. The authors have learned that such a policy has already been initiated by AFLC. In addition, the Air Force Logistics Needs Program, managed by the Air Force Coordinating Office for Logistics Research, provides DPMLs an avenue for identifying logistics deficiencies which might be candidates for technology solutions.

Test and Evaluation

Most respondents admitted they had limited experience in *Test and Evaluation* and wished they had more. The suggestions for improvement are summarized in three categories: preparing the contract statement of work (SOW), managing the R&M design and testing program, and working with the Air Force Operational Test and Evaluation Center (AFOTEC).

(1) The SOW must clearly identify the R&M goals the contractor must achieve and demonstrate during the test program. The DPML must establish test data points and work to ensure the contract offers sufficient rewards and penalties for progress in achieving the goals.

(2) Once the contract has been negotiated, the DPML must have a staff competent to evaluate the contractor's progress toward R&M goals. This requires an understanding of supportability design and R&M demonstration testing techniques.

(3) AFOTEC has many of the most experienced test managers in the Air Force. While the DPMLs acknowledged the need for AFOTEC to be an independent test voice, they pointed out there were circumstances in which constructive expert advice during test planning could save the Air Force money through the avoidance of unnecessary or ill-conceived tests. Most DPMLs suggested that such forewarning would not compromise AFOTEC's independence.

DPML Authority

DPML Authority was rated very low in impact, and only eleven of the respondents offered any improvements. The comments tended to fall into two categories: DPML skills and the control of logistics funds. The most common suggestions for improvement were to concentrate on improving the DPML selection process, establish and adequately staff the DPML office early, and monitor DPML performance more closely. A few believed some DPML control over funds used for achieving logistics goals would improve the DPML's ability to influence system design. But the majority opinion was that control of funds is less important than early requirement identification and clear contract coverage.

Organizational Structure

While the survey results showed *Organizational Structure* ranking lowest of the seven provided constraints, this constraint generated the most spirited discussions. Most respondents felt they were better off with the dual chain of command than they would be as members of the program office staff solely responsible to the program manager. They believed the current upper level emphasis on R&M had served to make their jobs easier by increasing their stature as the PMs' experts in a highly visible discipline. In those instances where they might need to challenge the PMs, the dual chain of command offers them some immunity to the pressure to conform inherent to the typical one-track command structure.

Two recommendations regarding organizational structure were offered almost unanimously by the respondents. Each is contentious and likely to be resented in some quarters, but each represents a pervasive attitude among the DPML respondents.

For example, 23 of the 28 respondents believed the R&M engineers within the program offices should work directly for the DPML rather than under the SPO engineering section. While they acknowledged that R&M achievement results from engineering design, they considered R&M characteristics so vital to supportability that their advocacy and development must be in the hands of the logistics community.

On the other issue, 24 of the 28 managers suggested that, although the AFALC staff has many highly qualified people, the staff had not provided their program any really beneficial assistance. They maintained that most of their help came from other program offices, from the air logistics centers, and from HQ AFLC, in that order. In their view, the primary staff function seems to be the solicitation of information from program office logisticians. The breadth of the dissatisfaction with the staff was clearly the biggest surprise coming from the interview process. The authors briefed the AFLC staff on these findings and believe there have been significant improvements in the staff's commitment to providing beneficial assistance to programs which request help. This is an area which requires continuous attention.

A DPML Wish-List

If one were to synthesize a "typical" DPML based upon this survey and ask for a summary of perceptions, the answer might be:

> I wish I had more experience in and education about the acquisition process. I wish I were more broadly informed about the various logistics functions and that there had been an opportunity and a mechanism to ensure logistics effects were given their proper weight and attention very early in the requirements and contracting processes. I'd like more control over selecting, educating, and retaining the logisticians who work for me—and I'd like more of them. There should be a career progression program specifically for acquisition logisticians. There ought to be better preparation for the logisticians who will influence and conduct test programs. When I need help in a very specialized area, there ought to be some well-trained teams prepared to lend assistance on an ad hoc basis. Finally, the more timely and constructive advice I can give the program managers, the more weight my opinions will carry in the SPO.

A final comment. We were struck by the breadth of knowledge and professional concern displayed by the DPMLs interviewed. An occasion which could have degenerated into a succession of "gripe sessions" was treated as an opportunity for proud professionals to apply experiences constructively toward the improvement of their profession. The suggestions were carefully conceived. They should be considered with equal care.

Notes

[1]Hull, Maj John R. and Capt Gregory L. Lockhart. "Barriers To Fully Implementing Integrated Logistics Support (ILS) in System Acquisition as Perceived by ILS Managers and Program Managers at the Aeronautical Systems Division," MS Thesis, LSSR 36-82. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB Ohio, September 1982 (AD-A122 979), p.

[2]Massey, Robert J. and others, "Improving the Acquisition System," *Concepts*, 4: 13-27 (Winter 1981), p. 19.

[3]Massey, p. 19.

[4]Wendt, Robert L. "An Industry Overview of DOD Manpower and Support Policy in Acquisition," *Logistics Spectrum*, 15: 4-7 (Fall 1981), pp. 5-6.

[5]Weinberger, Caspar W. Memorandum. "Realignment of the Office of the Secretary of Defense," Office of the Secretary of Defense, Washington, D.C., 29 January 1985, p. 1.

[6]Hull, pp. 45-46.

CAREER AND PERSONNEL INFORMATION

Civilian Career Management

PALACE ACQUIRE Intern Program

Does your organization have a large percentage of its experienced, seasoned personnel nearing retirement? Is your organization too small to support an internal training program, or are manpower/budget constraints preventing an influx of fresh talent into your organization? A PALACE ACQUIRE intern may be the answer to your predicament and an avenue to replenishing that loss of talent.

Program Objective

The PALACE ACQUIRE Intern, or PAQ, program is designed to attract college-educated men and women with management potential for a career in the USAF federal civilian service. This program recruits and selects high-caliber candidates and trains them to become competent, effective employees in a variety of occupational series; i.e., Logistics, Comptroller, or Information Systems.

Authorizations

Manpower authorizations for PAQ are administratively controlled and managed by HQ USAF. The number of intern authorizations varies each year depending upon changes in mission, projected manpower increases or reductions, skill requirements, and other operational considerations. Usually the allocations are 40-50 each year in the logistics career fields. The Air Force Civilian Personnel Management Center (AFCPMC), Randolph AFB, Texas, provides central management and control of salaries and training (tuition, travel, and per diem) for interns. In order to determine the PAQ authorizations for the next fiscal year, AFCPMC forwards a requirements call to the MAJCOMs asking for the number of PAQ intern allocations they can effectively support and place on a permanent position at the end of the intern's training program. An intern may participate in a two- or three-year training program, depending on the potential grade of the position. All interns receive a minimum of two full years of training.

Training

All good deals have a catch—right? While the interns are in training, the responsible command *must* ensure they are rotated throughout the organizations, released for formal training, and not "pigeonholed" in one position. Even though these interns can certainly fill a manpower void, they are not just a warm body. A training plan is formulated between the functional supervisor and AFCPMC which provides required training. This training is designed to ensure the intern not only receives experience that focuses on the "big picture" but also receives in-depth technical training for the targeted position.

Advantages

The advantages are twofold. First, the field can get a bright and eager college graduate at no cost to the command. Second, it can train this person for two/three years in a broad range of specialties and retain that trained talent at the end of the training period. The Air Force interns are primarily recruited on university campuses throughout the nation. By using this hiring format, the interviewers (career program staff and functional representatives) can offer intern positions to these candidates "almost on the spot." This accelerates the processing of interns into the system.

Occupational Specialties

Interns are selected for Logistics Management (346), Packaging (2032), Supply (20XX), Transportation Management (2130), Production Management (1101), Operations Research Analysts (1515), and Logistics Engineers (896). Fortunately, there are many opportunities in the core logistics fields.

The intern program is now approximately two years old and a number of the interns are now graduating from the program to journeyman positions in various commands. The caliber of the incoming interns, as well as the graduating interns, creates optimism for the future management needs of the Air Force. If you want to know more about the PAQ program, call AFCPMC/DPCMLR, Logistics Career Development Section, AUTOVON 487-4087. A member of the staff will be glad to answer your questions. Any requirements must be submitted through your MAJCOM.

(SOURCE: Kay Davis, AFCPMC/DPCMLR, AUTOVON 487-4087)

(The Military Career Management section will resume in the Fall issue.)

"Without supplies neither a general nor a soldier is good for anything."

Clearchus of Sparta Speech to the Greek Army
in Asia Minor, 401 B. C.

Combat Sustainability and Reconstitution Warfare: The Missing Link in Air Force Basic Doctrine

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*Col Collins was a student at AWC when he wrote this paper.

"The Air Force's basic doctrine ignores the potential contribution of the US industrial base."

Purpose

The purpose of this paper is to argue that the current Air Force approach to defense industrial base issues is inconsistent with the Defense Department's stated military strategy relative to conventional warfare and logistics sustainability—particularly for critical airframe, jet engine, and avionics spare parts. As a result, the Air Force's basic doctrine ignores the potential contribution of the United States (US) industrial base in maximizing the total warfighting capability of its tactical air forces.

Introduction

Prior to 1975, the Air Force and other military services had active programs designed to accomplish the mobilization of national manpower and industrial resources for the purpose of going to war. The Services' War and Mobilization Plans (WMP) assumed the worst-case situation whereby the day the nation started mobilization (M-Day) was also the same day military manpower and materiel resources were to be deployed (D-day). The publication of each fiscal year's WMP was the result of 18 months of planning activity that began with the threat and progressed through the process of translating wartime activity rates, i.e., flying hours by type of aircraft, into war reserve materiel and wartime production requirements for munitions, spare parts, and other mission-oriented items like aircraft fuel tanks and air-to-air missiles. For convenience in the budgeting process, M-Day and D-Day were assumed to be the first day of the government's fiscal year for which the eventual WMP was being prepared.

The primary conventional threat against which each WMP was developed was the military one projected by the Soviet Union in the Central European theater. During the 1960s, this threat was expressed as 2½ wars, meaning that the US should be prepared to fight 2½ wars of indefinite duration—ostensibly the one in Central Europe against the Soviets, plus one in Asia against the Chinese, plus a "brush-fire" war like Vietnam. In the early seventies, the 2½-war concept was revised to 1½ wars when it became clear the Chinese did not constitute a full war's planning effort. Then, in 1975, the wartime planning strategy was revised again to the short, "come-as-you-are" war. (See *AFJL*, Winter 1986, "The Short War: Strategy for Defeat," by Lt Gen Leo Marquez.)

The adoption of the short war strategy was based on several "assumptions":

(1) The US defense industry could not respond in time to provide any logistics support for US military forces engaged in combat in Central Europe.

(2) The cost of providing for a meaningful industrial mobilization capability would be astronomical.

(3) Our European Allies preferred for NATO to rely primarily on the US strategic nuclear deterrent should conventional warfare become a real possibility—so as not to make Central Europe a conventional war wasteland unnecessarily. (11:2)

Current industrial base planning activities by the Services focus on the preparation of an annual Production Base Analysis (PBA). The purpose of this document is to communicate industrial base deficiencies to the Office of the Secretary of Defense. In addition, the PBA serves as the vehicle for identifying and prioritizing proposed expenditures for industrial preparedness and industrial productivity enhancements.

Combat Sustainability

The current political environment is being driven by the defense reform movement, which is pressing issues concerning attrition warfare versus maneuver warfare, quality of weapon systems versus quantity of weapon systems, and combat leadership versus military management. Nowhere is there more need for real debate within the Air Force than the way in which wartime preparedness policies, and resulting programmatic decisions, have essentially dropped the logistics support capabilities of the US defense industrial base as an element in the deterrence of conventional warfare.

This situation has evolved despite clear direction from the President in National Security Decision Directive-47, dated July 1982, where he stated:

> It is the policy of the United States to have a capability to mobilize industry to achieve timely and sufficient production of military and essential civilian material needed to prosecute successfully a major military conflict, to lend credibility to national strategic policy, and to respond to national security emergencies. (5:7)

Additionally, Defense Secretary Caspar Weinberger has said that one of the priorities of the "Reagan defense program" is to have adequate inventories of munitions and equipment to fight conventionally long enough with the Soviets so as to not "force the president to make the choice between defeat or instant escalation." (14:5) Finally, Admiral William J. Crowe, Chairman of the Joint Chiefs of Staff, said that we must worry about the "war-stoppers." Our goal in sustainability is "logistics support to our conventional forces from initiation to successful termination of any conflicts." (8:33)

The present Air Force approach toward combat sustainability is: "Why should we be worried about D-Day +46 or +47 if we don't have enough force structure to get through D-Day +2 or +3?" Correspondingly, the Air Force's current position on funding for spare parts required for combat sustainability is "there is no money available." (1:3-5) Clearly, this issue needs to be fleshed out anew. We must ensure that current "assumptions" about a short war are consistent with the national risks of consciously disconnecting combat sustainability for our tactical air forces from both our national industrial base capabilities and formal wartime planning process.

The problem with planning any activity characterized by unbounded risk and uncertainty on a day-by-day basis is that the resulting plans become compartmentalized, and patently inaccurate, beyond the first few days of plan execution. What is needed is a holistic approach that integrates our national political and military strategies relative to a major conventional war with "all of our national resources" that could have a bearing on the outcome.

Another facet of the current Air Force approach to implementing a credible industrial preparedness capability is that the needed policies are already in place (Air Force Regulation (AFR) 78-10, *Industrial Base Program Planning).* It is the *allocation* of the necessary fiscal resources to actually implement cost-effective industrial base options that is missing. While the Air Force seems fairly well-situated for combat sustainability in terms of "iron bombs" and certain other types of munitions, one question remains unanswered. How are these munitions going to be delivered to the targets if critical jet engine and other spare parts are not available, except for cannibalization of assets in the field, following exhaustion of the war readiness spares kit (WRSK) inventories?

The Weak Doctrinal Link

The Defense Secretary's guidance to the Services relative to his objectives for logistics sustainability and industrial preparedness is contained in the annual Defense Guidance and respective DOD Directives. The Secretary's basic policies on industrial preparedness are contained in DOD Directive 4005.1, *Industrial Preparedness Program.* Air Force basic doctrine, the most fundamental and enduring beliefs which guide the proper use of aerospace forces, is published in Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force.* This document presents a 1976 quote from General F. Michael Rogers, former Commander of Air Force Logistics Command, which emphasized the importance of both readiness and combat sustainability in terms of what our enemies actually place value on when they assess our forces.

"Our basic warfighting doctrine should include more visible consideration of the US industrial base."

(4:4-9) AFM 1-1 further insists that warfighting capability is not credible without the logistics capability for sustained combat operations. (4:4-9). Unfortunately, while our basic doctrine is clear on the need for credible combat sustainability as a visible element of our total warfighting capability, it falls short by focusing only on our internal and organic logistics capabilities. To reflect our previous "experience in warfare" accurately, our basic warfighting doctrine should include more visible consideration of the US industrial base's obvious contribution to the final outcome of any future military conflict—either by supporting combat sustainability or providing the military hardware to reconstitute depleted forces in the "after-war" environment.

Clearly, we must project our thoughts beyond the initial battles of any future war to the point of maintaining political leverage in the "after-war" environment. Accordingly, it is reasonable to postulate that the side best prepared to reconstitute its forces following a short, highly intense conflict might be in a better position to succeed in a follow-on conflict a few months after the first one. Without industrial pipelines somewhat primed with semifinished manufacturing materials before the war begins, long-lead critical spare parts will not be available for up to two years later. (2:3-4)

"We have divorced the industrial preparedness option for critical aircraft spares from the doctrine and military strategy of our tactical air forces."

As a result of this area of weakness in the Air Force's basic doctrine, the Air Force has tended to ignore the potential contributions of the US industrial base in support of wartime, or wartime reconstitution, planning. For example, not a single critical spare part for the F100 jet engine that powers the Air Force's F-15 and F-16 aircraft has been formally planned with the prime contractor, Pratt & Whitney, under the USAF Industrial Preparedness Program in the last three years. Furthermore, for all 210 jet engine spares that were reviewed for the Fiscal Year 1983 Air Force PBA, the average procurement lead time was 16 months. (12:4-4-25) While the prospects for a six-month conventional war in Europe is low, it is clearly not zero. However, by "assuming" it to be zero, we have effectively divorced the industrial preparedness option for critical aircraft spares from the doctrine and military strategy of our tactical air forces. And, interestingly, it is the potential for a major military conflict in Europe that accounts for 56% of the annual military budget—$120 billion to $170 billion annually. (3:7) But, there is no money available for combat sustainability. (1:3-5)

The D to P Model

The D to P model in Figure 1 forms the basis for implementation of the industrial preparedness option as a deterrent to conventional war, as a critical element in winning the war, and as an essential national resource for reconstituting our depleted forces in the "after-war" environment. This model provides the analytic basis for cost effectively trading off reduced inventories of war reserve stocks for increased production responsiveness from the defense industry. Figure 1a displays the basic relationships in the combat sustainability equation. The Y-axis represents the wartime surge in materiel consumption rates above the peacetime usage levels as reflected by the X-axis. P-Day is the point in time when the production rate from industry equals, and continues to equal, the wartime consumption rate.

The total war reserve inventory is the sum of assets in the following two categories: *war readiness spares kits (WRSK)/base-level self-sufficiency spares (BLSS)* for the logistics support of combat units during the first few weeks of a conflict and *other war reserve materiel (OWRM)* for ensuring combat sustainability until industry can mobilize and achieve wartime production rates. WRSK represents air transportable spares kits for our front-line weapon systems. Both WRSK/BLSS and OWRM are additive to existing peacetime inventories of spares, known as peacetime operating stocks (POS). (2:3-4) The production offset represents the production from warm peacetime production lines that can be accelerated, or compressed, to reduce the amount of OWRM that would otherwise have to be prestocked before M-Day (the cross-hatched area).

The D to P application in Figure 1b reflects the normal situation regarding critical aircraft spares; i.e., a cold production line. As a result of the short-war philosophy, an arbitrary stockage point has, in the past, been set by the logistics community representing several weeks or a few months of wartime logistics support. With total manufacturing lead times for critical aircraft and jet engine spares on the order of two years (2:3-4), the arbitrary stockage point has historically been placed well to the left of the actual P-Day. This means that wartime flying hours will have to be cut back when on-hand POS and WRSK are exhausted. Regardless, even if the OWRM were funded and acquired, setting an arbitrary stockage point short of P-Day guarantees a "built-in" combat sustainability gap. The ultimate issue is thus whether or not we will run out of critical spares before we win. If the war does go on for several months, then we have guaranteed ourselves a combat sustainability gap for our tactical air forces.

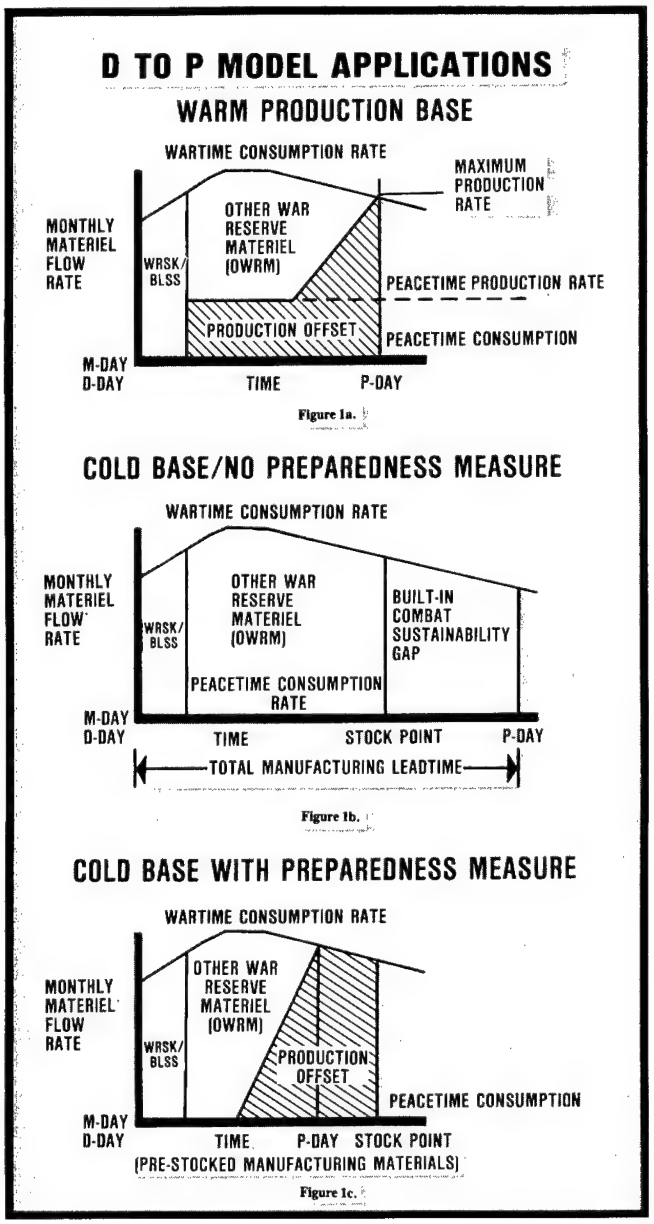

Figure 1.

The only realistic solution for effectively eliminating this combat sustainability gap lies in actually implementing the USAF Industrial Preparedness Program and funding the industrial preparedness measure (IPM) displayed in Figure 1c. This amounts to doing nothing more than establishing rotating inventories of semifinished parts (conventional or precision forgings or unmachined castings) at the manufacturing facilities of designated "planned producers." Such semifinished parts generally cost about 25% of the cost of the finished item and can usually be completed in 30 to 45 days and shipped to the combat unit or overhaul facility. (6:36) Figure 2 provides a quantitative analysis of alternative costs, total wartime inventory deficits, and sustainability gaps associated with implementing this IPM versus buying finished items in the OWRM inventory.

Figure 2 also shows how establishing an arbitrary stockage point can bias the decision away from the industrial preparedness measure and result in a "built-in" sustainability gap. For example, since the IPM cost is based on stocking semifinished manufacturing materials to cover the entire procurement lead time period, setting a three-month stockage point results in a positive cost benefit in favor of stocking the finished end items in the OWRM inventory. However, from a combat sustainability perspective, we have a "built-in" combat sustainability gap of seven months—a good guarantee of a "short war" for our tactical aircraft systems.

On the other hand, setting the stockage point at six months results in a positive cost savings for the IPM and basically eliminates the sustainability gap. Finally, by using a stockage point equal to or greater than the procurement lead time, a least cost combat sustainability posture can be achieved with a 70% dollar savings over the cost of stocking finished items in the OWRM inventory. Such a decision to implement the required industrial preparedness and combat sustainability relationship allows the Air Force to comply cost effectively with the Defense Department's military strategy concerning combat sustainability for aircraft spares. The level of savings will vary with the cost of implementing the IPM; however, the example in Figure 2 provides a relative perspective between the cost of the IPM and the potential cost savings.

The OWRM inventory can also be reduced by any of the following actions:

(1) Lowering the wartime consumption rate through improved reliability.

(2) Increasing the production acceleration line through expanded manufacturing capacity and/or improved manufacturing productivity.

(3) Incorporating some pre-M-Day assumptions regarding a probable time period for "strategic warning" where industry could be surged prior to M-Day. (10:62) Thus, the D to P

D TO P COST TRADEOFF CALCULATION

	MONTHS AFTER M-DAY											
	1	2	3	4	5	6	7	8	9	10	11	12
Monthly Wartime Requirement	20	30	40	50	50	50	40	40	40	40	40	40
Cold Base Prod (No IPM)	0	0	0	0	0	0	0	0	0	40	40	40
Qty Deficit (No IPM)	20	30	40	50	50	50	40	40	40	0	0	0
Enhanced Prod (With IPM)	0	15	40	50	50	50	40	40	40	40	40	40
Qty Deficit (With IPM)	20	15	0	0	0	0	0	0	0	0	0	0

End Item Unit Cost: $600

Industrial Preparedness Measure (IPM) Cost/Unit: $150 (Includes cost of storage)

COST TRADEOFF ANALYSIS

STOCKAGE POINT/ INDUS BASE POSTURE	QUANTITY DEFICIT	DOLLAR DEFICIT
3-Month (No IPM)	90	$ 54,000
3-Month (With IPM)	35	$ 21,000
6-Month (No IPM)	240	$144,000
6-Month (With IPM)	35	$ 21,000
12-Month (No IPM)	360	$216,000
12-Month (With IPM)	35	$ 21,000

D TO P COST TRADEOFF ANALYSIS

	3-MTH STOCKAGE		6-MTH STOCKAGE		12-MTH STOCKAGE	
COST TRADEOFF ELEMENTS	WITH IPM	NO IPM	WITH IPM	NO IPM	WITH IPM	NO IPM
Dollar Deficit	$21,000	$54,000	$21,000	$144,000	$21,000	$216,000
Less WRSK	$12,000	$12,000	$12,000	$ 12,000	$12,000	$ 12,000
= OWRM	$ 9,000	$42,000	$ 9,000	$132,000	$ 9,000	$204,000
Plus IPM Cost	$51,000	$ 0	$51,000	$ 0	$51,000	$ 0
= Cost Tradeoff Basis	$60,000	$42,000	$60,000	$132,000	$60,000	$204,000
IPM Cost Savings	−$18,000		+$72,000		+$144,000	
% Savings	---		55%		71%	
Sustaining Gap	0–2 Weeks	7 Months	0–2 Weeks	4 Months	0–2 Weeks	0 Months

NOTES:
- Since WRSK is required with and without the IPM, the value of the WRSK is not included in the cost tradeoff analysis.
- Procurement lead time is 10 months.
- Materiels/component lead time is 9 months.
- Final machining/assembly lead time is 30 to 45 days.
- For items with greater than 12 months procurement lead time, the dollar deficit is much greater, yet the sustainability gap is still 0 to 2 weeks.

Figure 2.

Model provides the most realistic approach for integrating peacetime acquisition and logistics strategies with wartime operational plans and strategies.

The Organizational Disconnect

With this background regarding the impact of the short-war military strategy on the combat sustainability of our tactical air forces, it is important to understand how the split in organizational responsibilities between the Air Force's two major acquisition commands also impacts the implementation of the Air Force's industrial base planning activities.

As indicated earlier, there are no meaningful industrial preparedness planning activities being accomplished within the Air Force at this time. Three years ago, HQ USAF delegated the responsibility for accomplishing required annual industrial base planning activities to Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC) in AFR 78-10. Their annual industrial base planning activities are focused on preparing the Air Force's annual PBA. In preparing the first PBA in 1983, the Air Force did perform detailed preparedness planning on the F100 engine and identified a requirement for $30 million to prestock semifinished manufacturing materials to enhance logistics sustainability. (12:4-1-31) These funds were supposed to be part of a Department of Defense sponsored funding wedge; however, Congress declined to provide the funding for the preparedness measure.

For the following planning cycle in 1984, HQ AFSC further delegated its industrial base planning responsibility to an office at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio. This office at ASD is known as the Office for Aerospace Industrial Modernization (AIM). Is it any wonder that the bulk, if not all, of funding being provided to industry is for industrial productivity measures? These productivity enhancing measures are no doubt properly justified based on future production cost savings. However, the real issue is whether the possible opportunity to save future production costs is more supportive of our national security policy and corresponding military strategy (winning future wars without the use of nuclear weapons) than the opportunity to provide for credible combat sustainability. The PBA is supposed to be the vehicle for analyzing and balancing our available industrial base investment funds with respective productivity and preparedness priorities.

It was recently announced that the Air Force had awarded over $100 million to three of the "big" aerospace defense contractors for "automated aircraft-manufacturing technology." (13:10) For firms that routinely invest no more than 2% to 4% of annual sales back into their defense-related industrial segments (7:308), this infusion of capital investment funds "from the taxpayer" represents an equivalent sales increase of about $3 billion—not a bad windfall for executives in an industry that often uses profits from defense work to invest in commercial activities.

So, it would seem more supportive of Air Force doctrine and our overall national policy of deterring all forms of conflict, including sustained conventional conflict, for at least some of these funds to be channeled through AFLC for the combat sustainability of tactical air forces. However, in reality, most of these funds are going through AFSC to a few, very highly capitalized, major defense contractors, who ought to be spending their own money for these new capital investments to remain competitive internationally. For, under the Competition In Contracting Act, which became effective in April 1985, foreign firms can generally compete in open competition for DOD contracts with certain exceptions, one of

which is that category of procurements that must be negotiated directly with US producers for industrial mobilization reasons.

Policy and Organizational Recommendations

From a policy perspective, the Air Force should take the following actions:

(1) Expand the doctrinal coverage of combat sustainability in AFM 1-1 to include more visibly the US defense industrial base as a credible element in deterring conventional warfare.

(2) Establish OWRM inventory objectives using the indicated IPM to eliminate cost effectively the combat sustainability gap for critical aircraft spares.

Another option is to build on the total force concept that very visibly combines the readiness of our active and reserve tactical air resources into a complete warfighting capability. By integrating required industrial base capabilities with our existing war readiness capabilities in the active and reserve forces, we could create a more broadly defined total force concept integrating both readiness and sustainability into a total warfighting capability.

Organizationally, the two acquisition commands will continue to pursue initiatives that support their respective areas of acquisition responsibility. What is missing from the current industrial base planning structure is the existence of an organization that balances the allocation of funds between competing industrial preparedness and industrial productivity initiatives. In addition, such an organization could provide industry with a single focal point for integrating defense issues into their internal strategic planning programs. (8:34) The organizational structure in Figure 3 provides one possible approach for integrating both Air Force and industrial corporation planning systems. But, where in the Air Force should this organization be placed?

I recommend that such a planning organization be located as an adjunct to the AU Center for Aerospace Doctrine, Research and Education (CADRE) at Air University. While AFSC and AFLC would still actually perform the annual industrial base planning and prepare the annual PBA, the placement of this integrating organization with CADRE would ensure that proposed industrial base investments receive the needed review in terms of prevailing military doctrine and strategy. This placement would also provide industry with an industrial resource coordination point outside the day-to-day pressures of the overall acquisition community. Finally, with the new emphasis on "jointness," this approach would not only provide Air University a significant role in addressing industrial preparedness, industrial productivity, and combat sustainability issues, but would also provide the Air Force with an organization to interface directly with the Mobilization Concepts Development Center at the National Defense University.

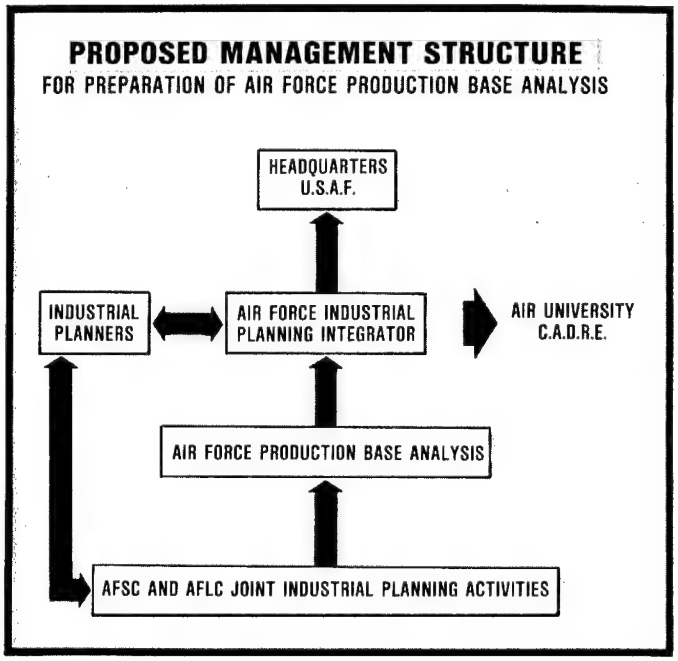

Figure 3.

Conclusion

Failure on our part to effectively integrate our national industrial base with our tactical air warfighting capabilities to ensure wartime logistics sustainability, or the ability to reconstitute forces quickly following a short war, clearly provides defense detractors with a powerful argument for massive reductions in defense expenditures relative to the conventional defense of Europe. After all, if about half of the annual military budget is justified by the need to support the European war possibility, then we could probably, as a nation, be able to reduce our military budget significantly by placing a "trip-wire" military force in Europe. In addition, such a reduction in troop strength in Europe would also significantly help reduce, if not eliminate, both our Federal budget and national trade deficits over a period of perhaps four or five years. Further, if the Air Force is not able to sustain tactical air operations in Europe effectively, then it seems unlikely that the Army could sustain ground operations without the Air Force's tactical air support. Accordingly, our current total force concept—combining the warfighting capabilities of the active and reserve tactical air forces—should be expanded to include specifically the combat sustainability strengths of the US industrial base. And, this expanded concept should be visibly written into Air Force basic doctrine.

Finally, the frightening aspect of the industrial preparedness and combat sustainability linkage is the apparent degree of confidence that many of our senior leaders have in our corporate ability to sustain combat operations. Are we blindly assuming that industrial production will be there when we need it? Are our operational commanders even aware of the "built-in" sustainability gap and the impact this gap could have on both sustainability and force reconstitution? Have prior programmatic decisions to buy force structure and readiness at the expense of sustainability limited our actual warfighting capabilities? Before judgements are made based on less than perfect information, the time is right for us to debate internally the pros and cons of consciously divorcing ourselves from our wartime materiel pipeline to the defense industrial base.

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2. *Air Force Issues Book*. Headquarters, United States Air Force, Washington, D.C., Spring Edition, 1986.
3. Alperovitz, Gar. "No More Rich Uncle To Rich Allies," *The New York Times*, 21 February 1986. p. 7.

TO 13 ▶

Contract or Organic Maintenance: A Matter of Dollars and Common Sense

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In August 1986, Headquarters United States Air Force directed the Air Training Command (ATC), Randolph AFB, Texas, to conduct cost comparison studies at four undergraduate pilot training (UPT) bases, three technical training centers (TTC), and the undergraduate navigator training (UNT) base aircraft maintenance and equipment maintenance squadrons.[1] ATC subsequently announced that 3,610 military and 653 civilian aircraft maintenance authorizations at five locations and 478 military and 202 civilian equipment maintenance specialist authorizations at three locations would be affected by these A-76 cost comparison studies.

The A-76 cost comparison is a direct response to the Office of Management and Budget (OMB) A-76 Circular which states, ". . . the Government shall not start or carry on any activity to provide a commercial product or service if the product or service can be procured more economically from a commercial source." In the past, this was interpreted to mean the government would not compete against private concerns in their own industry.

The philosophy of A-76 goes back to the 1950s, to a widely ignored Bureau of the Budget Bulletin that asserted the government should rely on free enterprise and the private sector for products and services. Over the intervening years, revisions and changes were made that began to put "teeth" into the free enterprise/private sector concept.

"The Air Force pioneered objective cost comparison criteria that were eventually adopted by DOD."

Revisions and changes addressing comparative cost analyses began to evolve into what we now have today: a powerful OMB directive that not only strongly pushes the intent of cost comparing commercial activities for contract, but mandates the procedures on how this will be done. These procedures are not new to the Air Force, which pioneered objective cost comparison criteria eventually adopted by the Department of Defense (DOD) in the 1960s. In 1979, the Air Force pioneered the concept of paying contractors based on a performance-oriented statement of work criteria. Both initiatives have subsequently been made part of OMB Circular A-76. Except for replacing "Air Force" with the word "government," OMB left Air Force procedures largely intact. The Air Force also played the biggest role in developing objective, cost-based justification to award service contracts based on firm-fixed-price-bids.[2]

ATC's first organic aircraft maintenance organization to be contracted out was Vance Air Force Base, Oklahoma, which converted to civilian contract maintenance in 1960. This was followed in 1966 by the German Air Force Jet Pilot Training (GAF) aircraft maintenance operation at Sheppard Air Force Base, Texas. The GAF program converted to the Euro-NATO Joint Jet Pilot Training (ENJJPT) program in 1982 and is still supported by an aircraft maintenance contract. The success of these two contract maintenance activities is reflected in the command's annual maintenance analysis. The figures show these two contractors have maintained assigned aircraft to command standards for maintenance with a 25% reduction in maintenance man-hours.

ATC continued to contract out maintenance activities as civilian contractors took over transient maintenance at all ATC bases starting in 1981. The aircraft instrument flight simulator maintenance was the last organic maintenance activity to be contracted out with all UPT bases receiving civilian contract maintenance workers.

"Depending on wartime requirements, non-core areas were identified and ranked by six mission areas."

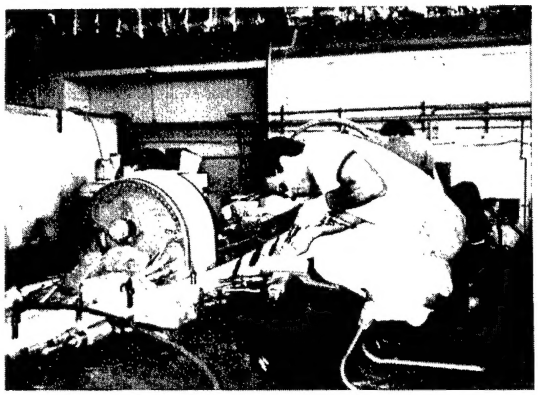
In 1983, the Air Force convened an A-76 Blue Ribbon Group comprised of General Officers whose purpose was to identify the Air Force's core functions (those functions not considered suitable for civilian contractors). Basically, and depending on wartime requirements, non-core areas were identified and ranked by six mission areas. It was within these mission areas (strategic, tactical, airlift, depot, training, and research and development) that the ATC's transient maintenance, wash rack, simulator maintenance, and precision measurement equipment laboratories fell.[3]

Since the transient maintenance and simulator maintenance operations had already been contracted out and the precedent set for contracting out aircraft maintenance, it was not too much of a surprise when ATC was directed to conduct the cost comparison studies at the four UPT bases, three TTCs, and the UNT bases.

The Gramm-Rudman amendment to balance the federal budget placed additional pressure on the DOD to reduce the defense budget. Further, President Reagan advocated turning over government business to the private sector by contracting out 40,000 additional federal jobs. This presented the Air Force with the problem of expanding its forces to support the new weapon systems it was acquiring (Peacekeeper missile, B-1B bomber, ground-launched cruise missile, and planning

Maintenance Contracting— An Illustrative Case

Urbano Ramirez working reassembly of a crash-damaged T-38 aircraft at the Queen Bee facility at Randolph AFB TX.



Vincent Tocci laying out, drilling, and fitting a new steel longeron. This is a beef-up of the T-38 backbone which will enable ATC to fly the T-38 into the next century.

Etta Johnson working the T-5 amplifier installation modification for a T-38 aircraft.

The Lear Siegler Management Services Corporation Contract Field Team at Randolph AFB, Texas, has accomplished numerous T-37 and T-38 depot level TCTOs on over 6,800 aircraft (recycles included) since FY 1976. Some of their major fleet-wide projects have included T-38 storage and wing changes, A/T-37 analytical condition inspections (ACI), T-37 windshield replacement, and T-37 main spar modifications. They have also returned several crash-damaged aircraft to service at a fraction of the replacement cost.

The team at Randolph is currently accomplishing a depot level dorsal longeron modification and reinforcement TCTO and sixteen related Depot Economy Repair Program (DERP) tasks as a part of the T-38 Pacer Classic Sustainability and Modernization Program. The Pacer Classic program is designed to allow the Air Force, by modification and enhancement, to continue using the T-38 Talon through the year 2010 while reducing maintenance costs and improving system safety and training. The T-38 first entered the Air Force inventory in March 1961 as an advanced trainer.

for the advanced technology fighter) at a time when money would be increasingly limited. Without an increase in manpower, the Air Force had to look within its own manning to find the resources to support these new weapon system acquisitions.[4]

The resulting cost comparison studies will change forever the maintenance operation at affected bases. Win or lose, the organic maintenance activities will lose all their military aircraft maintenance personnel except for a small number of quality assurance representatives who will monitor contractor performance.

The cost study issue is sensitive and controversial. For example, according to a 1981 Congressional Budget Office study, the DOD is the largest employer of commercial activity workers and accounts for 80% of federal cost for commercial services. From 1979 to 1981, the DOD showed 60% of the work studied went contract with average costs dropping nearly 20%. Of these 440 cost studies, the overall costs were reduced 20%—whether the operation stayed organic or not. The conclusion: Government workers bid lower because of the competitive threat from private enterprise.[5]

Federal employee unions were not happy with these moves or the conclusions drawn. They subsequently raised questions about contractor effectiveness by casting the shadows of contractor strikes, poor service, and higher absenteeism. Some of these arguments found sympathetic ears in Congress, who, in 1983, put a six-month moratorium on letting service contracts.[6]

Historically, the contract vs organic activity has been a political "hot potato" starting with the way manpower costs were computed. In 1975, the OMB asked that a figure be established to reflect the "overhead" cost accounting responsibility that would be figured into the organic cost estimate. This figure was intended to reflect more accurately the fringe benefits (medical and retirement obligation) that the government paid its workers and which all civilian contract bidders had to add into their cost estimates. The first computation showed 155% of the direct labor cost would have to be used to compare total federal work force cost to the contractors' costs. The opposition to this computation by the federal workers was too great and the Office of Personnel Management had to recompute; disregarding the unfunded liability of the Civil Service pension as well as obligations due in the future, a 134% factor was computed. With the unions and Congress still objecting, the OMB was forced to use a 120.4% factor. This was a much less accurate compensation figure, but was politically viable.[7] These rates change periodically and stood at 129.65% as of July 1987.

The bidding process is a very technical chain of events which will not be addressed; however, it should be noted that, in order for a contractor to replace an existing organic activity, it must underbid by at least 10%. This built-in advantage has

been a controversial item and has been challenged repeatedly by civilian contractors. However, once a federal activity is underbid, they can only get back in by underbidding the incumbent civilian activity by 10%, so the 10% in-house advantage works both ways.

In A-76 cost comparison studies, the obstacles are numerous and politics inescapable. But there should be no reason why organic maintenance activities (and indeed most all other traditional military functions at ATC bases) could not be converted to contract activities—or at least to "lean" federal organic activities to achieve economic savings and resultant transfer of military personnel back to the front-line commands to support the new weapon systems.

ATC bases have a basic mission—to train airmen, be they pilots, maintenance technicians, or any other specialist required by the Air Force. To do this, the Air Force has traditionally provided ATC with military specialists in every career area to train the new airmen in their selected fields.

Unlike other commands in the Air Force, ATC does not deploy (except for approximately 9,000 mobility commitments, which are primarily medical, civil engineers, security police, transportation, and services personnel). During a wartime scenario, ATC must increase its production of trainees needed to support the increased war activity. It will do this from currently operated locations. Thus, the need for a large contingent of military personnel to run these training bases is not justified outside traditional military values.

"Contracting out the four UPT base maintenance activities and the three technical training center consolidated maintenance squadrons will put 4,088 highly skilled maintenance personnel in critically short aircraft specialties back into the front-line commands."

Contracting out the five flying training base maintenance activities and the three TTC consolidated maintenance squadrons could make 4,088 highly skilled maintenance personnel in demanding aircraft specialties available to the front-line commands. This will help the Air Force meet its demand for manpower to support new weapon system acquisitions and stay under the legal ceiling for end-of-year force strength.

But, what will happen to the federal workers that stand to lose their jobs if the civilian contractor underbids the organic activity? And why is a civilian contractor able to do the same job with substantially less people?

As for displaced federal workers, the government intends to make all attempts to satisfy the employees' needs through lateral reassignments. The workers also have the "right of first refusal" on the jobs the contractors will have when they hire the personnel needed to fulfill the terms of the contract. However, this does not mean the workers are entitled to the same wages they received before, even if they were doing the same job. The contractors are bound to pay the displaced federal workers according to the wages set by the Department of Labor for the specific job they are obligated to provide under the terms of the contracts.

The contractors usually do the job with less people and, in some cases, substantially less people. Several factors enter into this. One is a management problem unique to military when compared with companies of comparable size and technology—an unstable work force. Military supervisors in an aircraft maintenance organization are typically senior officers who will be in their jobs for two or three years. Their staff officers and senior noncommissioned officers will also be in their current jobs from two to four years. During this time, these officers and senior NCOs must learn a very complex and highly technical weapon system that they may not have worked on at their last base. They must do this with a work force that is very young, just as mobile as their supervisors, and just as likely to be inexperienced on the weapon system. Because of the advanced technology of today's weapon systems, this unstable work force shows all the signs of being an untrained work force.

Management must then spend more time training its work force and must have more people to do the job. Contractors, on the other hand, can hire experienced personnel, most often trained Air Force personnel who have separated from the service, and keep them in place for long periods of time. Cross utilization and minimum training time allow contractors to use less people to accomplish the mission.

These are just a few of the tangibles and intangibles that affect the way an organic activity operates in comparison with a contractor. They show that, while it may be easy to jump to conclusions about who can do the better job, I believe these factors do not detract from the conclusion that military aircraft functions should be taken out of ATC and that other ATC functions should be considered for conversion as well.

In looking at how ATC accomplishes its primary mission while conserving Air Force combat resources, we must be willing to change to prepare for what is to come rather than prepare for what has already happened. General Marquez states, ". . . we must debunk the myth that the Air Force will operate in wartime like it does in peace."[8] We must use our resources to their potential, which is not to take critical skills out of the front-line commands to maintain trainers and teach new airmen.

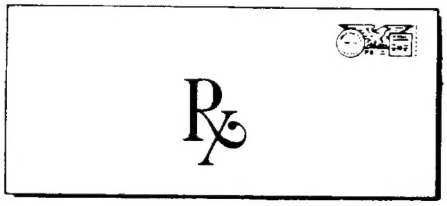
Notes

[1]HQ USAF/PRM's Message to HQ ATC/XP, 22 Aug 86.
[2]Schaub, Maj Kenneth L. "So You're a Candidate for Contracting Out: Plain Talk about Cost Comparison Studies for the Base Level Manager," *Air University Report Number 85-2305*, p. 3.
[3]Ibid., p. 8.
[4]"1988 Budget Request Seeks Further Fed Economies," *Weekly Federal Employees News Digest*, Vol 36, No. 22, 12 Jan 87, p. 1.
[4]Schaub, p. 14.
[6]Ibid.
[7]Ibid., pp. 16 and 17.
[8]Marquez, General Leo. "The Logistics Warrior," *Air Force Journal of Logistics*, Vol 10, No. 2., Spring 1986, pp. 9-11.

"People and not things are the fundamental factor determining the outcome of war."

General Lo Jui-Ching: *In Red Flag*
May 1965

READER EXCHANGE



Call for Combat Arms

I certainly agree with the essence of Captain Keller's "call for combat arms" (*AFJL*, Spring 1987); however, I must question why the paper addresses only Europe. Certainly, in Korea the problem would be as great, or greater, due to the more restricted geography. And, in fact, the problem would exist anywhere we had logistics troops and organizations accessible by enemy forces or enemy underground.

The idea of the "logistics infantry" is not new. When I enlisted in the Army Air Corps in September 1939, I signed for duty as an aircraft mechanic. I was told I could have that job; but I was first a soldier and then I might be an aircraft mechanic. So, my training, before I finally got a real job in maintenance, included a lot of weapon familiarization, some field work with entrenching tools, forced marches, maneuver activities, convoy behavior, and gas mask drills. I was told I would have to requalify as a soldier every year, but before the first requalification came about, the world's conditions had changed enough that mechanical experience was needed more than was my infantry body! The Air Corps and the Air Force never did later create much actual ground warfare capability until the security police in Vietnam.

If there is to be a logistics infantry, the USAF must *(MUST!!!)* provide suitable repeated and continuing training for all logistics people and must recognize logistics in a more broad manner than now. What would be required is recognition that everyone in the AF, short of the actual combat crews (and I would include MAC in this group), is in truth part of logistics as they labor to create and sustain military capability. Therefore, practically everyone in the AF must acquire and retain that "infantry capability." Will the AF agree that part of the AF member's time *must* be spent in the field and on the range?

Obviously, for the logistics infantry to work, there must be ready access at all times to weapons, field gear, ammunition, explosives, and gas gear. Again, will the AF make these weapons quickly available without massive red tape? Will the manpower people agree to factor a certain additional number of people for weapons care (unit armorers)?

I don't know the answer, but I don't see the logistics infantry as something to be jumped on without considerable study. Certainly, every AF person, male or female, should be continually current in a means of ground combat. And, just as certainly, some people in the more grand conception of logistics should be trained in and currently competent in direction of ground force defense of the air base and the logistics structure. I would surely recommend that action to the AF immediately if you could convince the powers to institute, and permit, the effective training programs.

Jerome G. Peppers, Jr.
Fairborn, Ohio

R&M for Commodities

I was disappointed in Mr Thomas Sherman's article, "R&M for Commodities?" It's ironic that the very next article was a glowing display of how the Weapon System Master Plan (WSMP) is dealing with the issue of R&M, written by Brigadier General Farrington. Perhaps he got educated by reading your Winter issue. Let's assume he didn't.

Perhaps the reason why commodities escape our attention is because they are not very romantic. I mean who gets excited over accumulators, valves, transmitters, instruments, actuators, brakes, engine controls, etc. They don't even have the "catchy" names like "eagle," "falcon," "starlifter," or even the "warthog." It should have been blatantly obvious to Mr Sherman that there is an "onslaught" being waged in AFLC, along with our users in the arena of "commodities." Brigadier General Farrington's description of the R&M attack on WRSK assets clearly conveys the message that the commodity war is on.

However, the war is not being conducted in the mental quagmire of LCC gibberish, a point on which I agree with Mr Sherman. It is being waged in the warrior's term of break rate and fix rate (thanks TAC). When you look at the B-52 OAS modification and the F-111 AMP modification, they are being sold on the only criteria that counts: bombs on target, better known in the R&M world as "combat capability." In a world of diminishing resources in terms of funds and people, it is almost a major crime that we have seen "inviolate" warfighting additives, the WRSK, degrade to the point that it now becomes nothing more than a priority 2 stock replenishment vehicle for assets that simply have intolerable break rates. Far too long, we, in the logistics business, have simply considered buying our way out of problems. That mentality has changed!

On 4 Sept 1986, the AFLC Vice Commander charged our centers to "fix," not "buy" our way out, as he reaffirmed AFLC's commitment to the AF R&M 2000 program. At each of our centers the battle is heating up. We now ask, "Why is it breaking and what technical options do I have to fix the failure mode?" It's in the SPM's drumbeat, in the IM's drumbeat, and most important in senior management's drumbeat across the command. We are seeking that level of time between removal where the user would gracefully discard any continued intermediate investments for the simple reason that he couldn't keep his maintenance troops "trained." We are seeing it happen all over the Air Force. Since one SAC base has flown the CFM-56 (KC-135R) for over one year, and never dropped an engine, now they are migrating to a logical "Queen Bee" and redistributing 90 people to other critical requirements. After 100 hours of flying the F-111 AMP, SAC is now revisiting their intermediate planning since only two AMP related failures have occurred. The F-4 will be modified with fuel quantity systems that go from 500 hours to over 2500 hours calibration free. Now, what DCM in his right mind would continue to pursue intermediate investments when his GIs may see one failure in "two enlistments."

That's my point. We, not the users, control the intermediate domain. We are the ones who can free the user of traditionally constraints. We have the obligation to drive the level of time between removal so high. He will let go—but on his terms—when he sees it on his flight line!

We are embracing the philosophy of "on-off" equipment maintenance vs "two levels." We understand the difference. We understand off-equipment maintenance may be traditionally three levels: a Queen Bee, a remove-bench check-evacuate, or the nearest trashcan if its 10,000 hours. Most importantly, we understand the user is in control of where and when he will shift to a more meaningful maintenance concept. What we need to do is create an environment where he will gladly embrace a shift because it's to his advantage. The majority of the assets we are talking about are the very commodities Mr Sherman seems to think have gone unnoticed.

Colonel John C. Reynolds, USAF
Deputy Assistant for R&M
Hq AFLC Dir of Materiel Mgt

Ed: Without doubt, system-oriented "commodities" are the heart and soul of R&M improvement. They are the very subsystems and components that break and give maintainers and commanders fits. The commodities we understand Mr Sherman to have been addressing, though, are commercial, off-the-shelf, non-airborne items used commonly by the military and civilian sectors. For these—which represent big bucks in totem—R&M concepts have payoffs but should not be overzealously applied to the point that bidders will not respond. Mr Sherman was not complaining that these were not receiving high-level R&M attention; indeed, he feared they might, and offered a cost-effective method of meeting the challenge.

The Most Significant Article Award for the Spring 1987 issue will be published in the Fall issue of the Journal.

With this issue,
AFJL says farewell to
Lt Colonel Dave Rutenberg,
Editor, upon his retirement.

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Dave has the best wishes of the entire logistics community.